MIDLANDS TECHNICAL COLLEGE

GMC

Project Manual

MIDLANDS TECHNICAL COLLEGE
AMSC Expansion - Airport

West Columbia, South Carolina





Architect's Project Number: ACOL240010

OSE Project Number: H59-N301-**SB**

Bid Documents

12/15/2025

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PROJECT NUMBER: H59-N301-SB

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SE-310
INVITATION FOR DESIGN-BID-BUILD CONSTRUCTION SERVICES

AGENCY/OWNER: Midlands Technical College

PROJECT NAME: AMSC Expansion - Airport

PROJECT NUMBER: H59-N301-SB **CONSTRUCTION COST RANGE:** **$** 1,800,000 to **$** 2,100,000

PROJECT LOCATION: 1260 Lexington Drive, West Columbia, S.C. 29170

DESCRIPTION OF PROJECT/SERVICES: New addition and interior shop renovation to the AMSC Building

BID/SUBMITTAL DUE DATE: 03/18/2026 **TIME:** 12:00pm **NUMBER OF COPIES:** 1

PROJECT DELIVERY METHOD: Design-Bid-Build

AGENCY PROJECT COORDINATOR: Tommy Wise

EMAIL: franklintwise@midlandstech.edu **TELEPHONE:** 803-822-6757

DOCUMENTS MAY BE OBTAINED FROM: https://www.midlandstech.edu/procurement/construction-projects

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: $ 0.00 **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: Goodwyn Mill Cawood, LLC **A/E CONTACT:** Justin Lucas, AIA

EMAIL: justin.lucas@gmcnetwork.com **TELEPHONE:** (251) 581-1905

PRE-BID CONFERENCE: **Yes** ☒ **No** ☐ **MANDATORY ATTENDANCE:** **Yes** ☐ **No** ☒

PRE-BID DATE: 02/25/2026 **TIME:** 10:00am

PRE-BID PLACE: AMSC Building on the MTC - Airport Campus, 1260 Lexington Dr.,, W.Columbia, S.C. 29170

BID OPENING PLACE: Conference Rm 119 Reed Hall on the MTC - Airport Campus 1260 Lexington Dr., W.Columbia S.C. 29170

BID DELIVERY ADDRESSES:

HAND-DELIVERY:

Attn: Tommy Wise
1260 Lexington Drive, Operations Building
West Columbia, S.C. 29170

MAIL SERVICE:

Attn: Tommy Wise
1260 Lexington Drive
West Columbia, S.C. 29170

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

APPROVED BY: _____ **DATE:** _____

(OSE Project Manager)

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

Instructions to Bidders

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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)
AMSC Expansion – Airport
H59-N301-SB
1260 Lexington Drive, West Columbia, SC 29170

THE OWNER:
(Name, legal status, address, and other information)
Midlands Technical College
1260 Lexington Drive
West Columbia, SC 29170

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)
Goodwyn Mills Cawood, LLC
915 Lady Street, Suite C
Columbia, SC 29201

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

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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.

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§ 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.

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§ 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.

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§ 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.

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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 Bid all requested Alternates. The failure of the Bidder to indicate a price for an Alternate may 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".

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§ 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 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.

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§ 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 list qualified subcontractors as required by law;

.6 Showing any material modification(s) or exception(s) qualifying the Bid;

.7 Faxing a Bid directly to the Owner or Owner's representative; or

.8 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

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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: Conference Room 119
Building Where Posted: Reed Hall - MTC Airport Campus
Address of Building: 1260 Lexington Dr., W. Columbia SC 29170
WEB site address (if applicable): https://www.midlandstech.edu/procurement/construction-projects
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 if 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,

.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.

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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 Sheet G1.01 Drawing Index		

.5 Specifications

Section	Title	Date	Pages
See Spec Index in Project Manual			

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.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

§ 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).

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§ 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.

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§ 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

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DRAFT

AIA® Document A310™ – 2010

Bid Bond

CONTRACTOR:
(Name, legal status and address)
« »« »
« »

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

OWNER:
(Name, legal status and address)
« »« »
« »

BOND AMOUNT: $ « »

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

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

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

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

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

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

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

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User Notes: (1752061749)

Signed and sealed this « » day of « » , « »

	« »
	(Contractor as Principal) *(Seal)*
	« »
(Witness)	*(Title)*
	« »
	(Surety) *(Seal)*
	« »
(Witness)	*(Title)*

DRAFT

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User Notes:
(1752061749)

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: Midlands Technical College

(Agency's Name)

FOR: PROJECT NAME: AMSC Expansion - Airport

PROJECT NUMBER: H59-N301-SB

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)*****:** New addition and interior shop renovation to the AMSC Building,

$ _____, 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)*: New Classroom with ladder-access mezzanine as storage. Including adjacent plumbing fixtures.

☐ **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)*: New Tool Storage.

☐ **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.

No.	ITEM	UNIT OF MEASURE	ADD	DEDUCT
1.			$	$
2.			$	$
3.			$	$
4.			$	$
5.			$	$
6.			$	$

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 page BF-2A)

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

(A) **LICENSE CLASSIFICATION or SUBCLASSIFICATION ABBREVIATION per SCLLR** *(Completed by Agency)*	**(B)** **NAME of SUBCONTRACTOR and/or PRIME CONTRACTOR** *(Completed by Bidder)*	**(C)** **SUBCONTRACTOR'S and/or PRIME CONTRACTOR'S SC LICENSE NUMBER** *(Completed by Bidder)*
BASE BID		
AC		
EL		
PB		
ALTERNATE #1		
ALTERNATE #2		
ALTERNATE #3		

SE-330
LUMP SUM BID FORM

INSTRUCTIONS FOR SUBCONTRACTOR LISTING

1. Section 7 of the Bid Form sets forth an Agency-developed list of subcontractor license classifications or subclassifications for which Bidder is required to identify the entity (subcontractor(s) and/or prime) Bidder will use to perform this work.
   a. **Column A**: The Agency enters the appropriate SCLLR abbreviation to identify the subcontractor license classification / subclassification for which the Bidder is required to list either a subcontractor or itself as the entity that will perform the work. Abbreviations of licenses can be found at:
   https://llr.sc.gov/clb/PDFFiles/CLBClassificationAbbreviations.pdf. If the Agnecy has not identified a subcontractor license classification/subclassification, the Bidder does not list a subcontractor.
   b. **Columns B and C:** The Bidder identifies the subcontractors, by name and license number, it will use for the work of each license listed by the Agency in Column A. Bidder must identify only the subcontractor(s) who will perform the work and no others. Bidders must make sure that their identification of each subcontractor is clear and unambiguous. A listing that could be any number of different entities may be cause for rejection of the bid as non-responsive. For example, a listing of M&M without additional information may be problematic if there are multiple different licensed contractors in South Carolina whose names start with M&M.
2. **Subcontractor Defined:** For purposes of subcontractor listing, a subcontractor is an entity who will perform work or render service to the prime contractor to or about the construction site pursuant to a contract with the prime contractor. Bidder should not identify sub-subcontractors in the spaces provided on the bid form but only those entities with which Bidder will contract directly. Do not identify material suppliers, manufacturers, and fabricators that will not perform physical work at the site of the project but will only supply materials or equipment to the Bidder or proposed subcontractor(s).
3. **Subcontractor Qualifications:** Bidder must only list subcontractors who possess a South Carolina contractor's license that includes the license classification and/or subclassification identified by the Agency in Column A. The subcontractor license must also be within the appropriate license group for the work (do not list the Group number). If Bidder lists a subcontractor who is not qualified to perform the work, the Bidder will be rejected as non-responsible.
4. **Use of Own forces:** If, under the terms of the Bidding Documents and SC Contractor Licensing laws, Bidder is qualified to perform the work of a listed subcontractor classification or subclassification and Bidder does not intend to subcontract such work but to use Bidder's own employees to perform such work, the Bidder must insert itself in the space provided.
5. **Use of Multiple Subcontractors:**
   a. If Bidder intends to use multiple subcontractors to perform the work of a single license classification/subclassification, Bidder must insert the name of each subcontractor Bidder will use, preferably separating the name of each by the word **"and"**. If Bidder intends to use both his own employees to perform a part of the work of a single license classification/subclassification and to use one or more subcontractors to perform the remaining work, Bidder must insert itself and each subcontractor, preferably separating them with the word **"and"**. Bidder must use each entity listed for the work of a single license classification/subclassification in the performance of that work.
   b. **Optional Listing Prohibited:** Bidder may not list multiple subcontractors for a license classification/subclassification in a form that provides the Bidder the option, after bid opening or award, to choose one or more but not all the listed subcontractors to perform the work for which they are listed. A listing, which on its face requires subsequent explanation to determine whether it is an optional listing, is non-responsive. If Bidder intends to use multiple entities to perform the work for a single listing, Bidder must clearly set forth on the bid form such intent. Bidder may accomplish this by simply inserting the word "**and**" between the names of each entity listed. Agency will reject as non-responsive a listing that contains the names of multiple subcontractors separated by a blank space, the word "or", a virgule (that is a /), or any separator that the Agency may reasonably interpret as an optional listing.
6. If Bidder is awarded the contract, Bidder will not be allowed to substitute another entity as subcontractor in place of a subcontractor listed in Section 7 of the Bid except for one or more of the reasons allowed by the SC Code of Laws.
7. Bidder's failure to identify an entity (subcontractor or itself) to perform the work of a subcontractor listed in Column A will render the Bid non-responsive.

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 **180** 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 $**200** 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: _____

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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® Document A101® – 2017

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

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

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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)

Midlands Technical College
1260 Lexington Drive
West Columbia, SC 29170

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)

AMSC Expansion – Airport
H59-N301-SB
1260 Lexington Drive, West Columbia, SC 29170

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

Goodwyn Mills Cawood, LLC
915 Lady Street, Suite C
Columbia, SC 29201

The Owner and Contractor agree as follows.

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

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TABLE OF ARTICLES

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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.

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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
N/A	

§ 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)
N/A		

§ 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.)

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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.

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§ 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: Peter Hemans

Title: Director of Operations

Address: 1260 Lexington Dr., W. Columbia SC 29170

Telephone: 828-808-1778

Email: hemansp@midlandstech.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: Tommy Wise

Title: Associate Director of Construction and Planning

Address: 1260 Lexington Dr., W. Columbia SC 29170

Telephone: 803-707-0479

Email: franklintwise@midlandstech.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:

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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: Justin Lucas

Title: Architecture Practice Leader

Address: 915 Lady Street, Suite C, Columbia, SC, 29201

Telephone: 251-581-1905

Email: justin.lucas@gmcnetwork.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.

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.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 Sheet G1.01 Drawing Index		

.6 Specifications

Section	Title	Date	Pages
See Spec Index in Project Manual			

.7 Addenda, if any:

Number	Date	Pages

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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

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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)*

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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)

AMSC Expansion – Airport
H59-N301-SB
1260 Lexington Drive, West Columbia, SC 29170

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.

THE OWNER:
(Name, legal status and address)

Midlands Technical College
1260 Lexington Drive
West Columbia, SC 29170

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)

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.

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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

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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.

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§ 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 N/A ($) per claim and ($) 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 N/A ($) per claim and ($) 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.)

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Causes of Loss	Sub-Limit

§ 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.)

N/A

§ 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

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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	100% of Contract Price
Performance Bond	100% of Contract Price

§ 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:

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General Conditions of the Contract for Construction

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South Carolina Division of Procurement Services, Office of State Engineer Version of AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

AMSC Expansion – Airport
H59-N301-PG
1260 Lexington Drive, West Columbia, SC 29170

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

Peters Hemans
1260 Lexington Drive
West Columbia, SC 29170

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

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

Goodwyn Mills Cawood, LLC
915 Lady Street, Suite C
Columbia, SC 29201

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

.1 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.

.2 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.

.3 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.

.4 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.

.5 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.

§ 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.

§ 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 Reserved

§ 1.1.9 Notice to Proceed

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The Notice to Proceed is a document issued by the Owner to the Contractor directing the Contractor to begin prosecution of the Work in accordance with the requirements of the Contract Documents. The Notice to Proceed shall fix the date on which the Contract Time will commence and establish the initial date of the Substantial Completion.

§ 1.1.10 State Engineer

"State Engineer" means the person holding the position as head of the State Engineer's Office. The State Engineer's Office is created by S.C. Code Ann. § 11-35-830, and is sometimes referred to in the Contract Documents as "Office of State Engineer" or "OSE." The State Engineer is also the Chief Procurement Officer for Construction, sometimes referred to in the Contract Documents as "CPOC".

§ 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. In the event of patent ambiguities within or between parts of the Contract Documents, the Contractor shall 1) provide the better quality or greater quantity of Work, or 2) comply with the more stringent requirement, either or both in accordance with the Architect's interpretation.

§ 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, such determination shall not impair or otherwise affect the validity, legality, or enforceability of the remaining provision or parts of the provision of the Contract Documents, which shall remain in full force and effect as if the unenforceable provision or part were deleted.

§ 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 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 a violation 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

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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.

§ 1.6.3 Notice to Contractor shall be to the address provided in Section 8.3.2 of the Agreement. Notice to Owner shall be to the address provided in Section 8.2.2 of the Agreement. Either party may designate a different address for notice by giving notice in accordance with Section 1.6.1.

§ 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, including 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 provided in Section 7.1.7. 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 Representative noted in the Agreement.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen (15) days after receipt of a written request, information necessary and relevant for the Contractor to post Notice of Project Commencement pursuant to S.C. Code Ann. § 29-5-23.

§ 2.2 Reserved

§ 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 a design professional lawfully licensed to practice, or an entity lawfully practicing, in the jurisdiction where the Project is located. The 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. Subject to the Contractor's obligations, including those in Section 3.2, the Contractor shall be entitled to rely on the accuracy of information furnished by the Owner pursuant to this Section but shall exercise proper precautions relating to the safe performance of the Work.

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§ 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. However, the Owner does not warrant the accuracy of any such information requested by the Contractor that is not otherwise required of the Owner by the Contract Documents. Neither the Owner nor the Architect shall be required to conduct investigations or to furnish the Contractor with any information concerning subsurface characteristics or other conditions of the area where the Work is to be performed beyond that which is provided in the Contract Documents.

§ 2.3.6 The Owner shall furnish the Contract Documents to the Contractor in digital format.

§ 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, including but not limited to providing necessary resources, 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 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 Representative noted in the Agreement.

§ 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.

.1 The Contractor acknowledges that it has investigated and satisfied itself as to the general and local conditions which can affect the Work or its cost, including but not limited to (a) conditions bearing upon transportation, disposal, handling, and storage of materials; (b) the availability of labor, water, electric power, and roads; (c) uncertainties of weather, river stages, tides, or similar physical conditions at the site; (d) the conformation and conditions of the ground; and (e) the character of equipment and facilities needed preliminary to and during work performance.

.2 The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is

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reasonably ascertainable from an inspection of the site, including all exploratory work done by the Owner, as well as from the drawings and specifications made a part of this Contract.

.3 Any failure of the Contractor to take the actions described and acknowledged in this Section will not relieve the Contractor from 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 Owner.

§ 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 latent 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.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

§ 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 and provide its findings to the Owner. Unless the Owner 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.

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§ 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.

§ 3.4.2.1 After the Contract has been executed, the Owner and Architect may consider requests for the substitution of products in place of those specified. The Owner and Architect may, but are not obligated to, consider only those substitution requests that are in full compliance with the conditions set forth in the General Requirements (Division 1 of the Specifications). By making requests for substitutions, the Contractor:

- **.1** represents that it has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to the product specified;
- **.2** represents that it will provide the same warranty for the substitution as it would have provided for the product specified;
- **.3** certifies that the cost data presented is complete and includes all related costs for the substituted product and for Work that must be performed or changes as a result of the substitution, except for the Architect's re-design costs, and waives all claims for additional costs related to the substitution that subsequently become apparent;
- **.4** agrees that it shall, if the substitution is approved, coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects; and
- **.5** represents that the request includes a written representation identifying any potential effect the substitution may have on Project's achievement of a Sustainable Measure or the Sustainable Objective.

§ 3.4.2.2 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

§ 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 shall be considered defective. Unless caused by the Contractor or a subcontractor at any tier, 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. The Contractor shall comply with the requirements of S.C Code Ann. Title 12, Chapter 8, regarding withholding tax for nonresidents, employees, contractors and subcontractors.

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§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Pursuant to S.C. Code Ann. § 10-1-180, no local general or specialty building permits are required for state buildings. Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for all other permits, fees, and licenses 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 the difference between actual costs, as documented by invoices, and the allowances under Section 3.8.2.1.

§ 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, acceptable to the Owner, 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.

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§ 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 Owner may notify the Contractor, stating whether the Owner has reasonable objection to the proposed superintendent. Failure of the Owner 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 has made reasonable and timely objection. The Contractor shall notify the Owner of any proposed change in the superintendent, including the reason therefore, prior to making such change. 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. Subject to any additional requirements in the Contract Documents, the schedule shall contain detail appropriate for the Project, including at a minimum (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.

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§ 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.

.1 The fire sprinkler shop drawings shall be prepared by a licensed fire sprinkler contractor and shall accurately reflect actual conditions affecting the required layout of the fire sprinkler system. The fire sprinkler contractor shall certify the accuracy of its shop drawings and submit the drawings and hydraulic calculations to the Architect's fire protection engineer (FPE) for review and approval.

.2 The FPE will review, approve, and submit to the Office of State Fire Marshal (OSFM) the fire sprinkler shop drawings and FPE's certification indicating the shop drawings and hydraulic calculations have been reviewed and approved prior to OSFM review.

.3 Unless authorized in writing by OSE, neither the Contractor nor subcontractor at any tier shall submit the fire sprinkler shop drawings directly to OSFM.

§ 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, who shall comply with reasonable requirements of the Owner regarding qualifications and insurance and 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

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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 The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 Use of Site

§ 3.13.1 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.

§ 3.13.2 The Contractor and any entity for which the Contractor is responsible shall not erect any sign on the Project site without the prior written consent of the Owner.

§ 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) including loss of use resulting therefrom, but

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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. Any reference in the Contract Documents to the Architect taking action or rendering a decision with a "reasonable time" is understood to mean no more than ten (10) days, unless otherwise specified in the Contract Documents or otherwise agreed to by the parties.

§ 4.2.2 The Architect will visit the site as necessary to fulfill its obligation to the Owner for inspection services, if any, and, at a minimum, to assure conformance with the Architect's design as shown in the Contract Documents and to observe 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 informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) deviations from the Contract Documents, (2) 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 Work completed and correlated with 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.

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§ 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, in the first instance, interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. Upon receipt of such request, the Architect will promptly provide the other party with a copy of the request. 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, and will not show partiality to either. Except in the case of interpretations resulting in omissions, defects, or errors in the Instruments of Service or perpetuating omissions, defects or errors in the Instruments of Service, the Architect will not be liable for results of interpretations or decisions rendered in good faith. If either party disputes the Architect's interpretation or decision, that party may proceed as provided in Article 15. The Architect's interpretations and decisions may be, but need not be, accorded any deference in any review conducted pursuant to law or the Contract Documents.

§ 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 so as to avoid delay to the construction of the Project. The Architect's response to such requests will be made in writing with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information. Any response to a request for information must be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.

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Unless issued pursuant to a Modification, supplemental Drawings or Specifications will not involve an adjustment to the Contract Sum or Contract Time.

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, within fourteen (14) days after posting of the Notice of Intent to Award 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 Owner may notify the Contractor whether the Owner has reasonable objection to any such proposed person or entity. Failure of the Owner 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 has made reasonable and timely objection. The Owner shall not direct the Contractor to contract with any specific individual or entity for supplies or services unless such supplies and services are necessary for completion of the Work and the specified individual or entity is the only source of such supply or service.

§ 5.2.3 If the Owner has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner 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 makes reasonable objection to such substitution. The Contractor's request for substitution must be made to the Owner in writing, accompanied by supporting information.

§ 5.2.5 A Subcontractor identified in the Contractor's Bid pursuant to the subcontractor listing requirements of Section 7 of the Bid Form may only be substituted in accordance with and as permitted by the provisions of S.C. Code Ann. § 11-35-3021. A proposed substitute for a listed subcontractor shall also be subject to the Owner's approval as set forth in Section 5.2.3.

§ 5.2.6 A Contractor may substitute one prospective subcontractor for another, with the approval of the Owner as follows:

.1 If the Contractor requests the substitution, the Contractor is responsible for all costs associated with the substitution.

.2 If the Owner requests the substitution, the Owner is responsible for any resulting increased costs to the Contractor.

§ 5.3 Subcontractual Relations

§ 5.3.1 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

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prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise herein, or 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.

§ 5.3.2 Without limitation on the generality of Section 5.3.1, each Subcontract agreement and each Sub-subcontract agreement shall include, and shall be deemed to include, the following Sections of these General Conditions: 3.2, 3.5, 3.18, 5.3, 5.4, 6.2.2, 7.1.6, 7.3.3, 7.5, 13.1, 13.9, 14.3, 14.4, and 15.1.7.

§ 5.3.3 Each Subcontract Agreement and each Sub-subcontract agreement shall exclude, and shall be deemed to exclude, Sections 13.2 and 13.5 and all of Article 15, except Section 15.1.7, of these General Conditions. In the place of these excluded sections of the General Conditions, each Subcontract Agreement and each Sub-subcontract may include Sections 13.2 and 13.5 and all of Article 15, except Section 15.1.7, of AIA Document A201-2007, Conditions of the Contract, as originally issued by the American Institute of Architects.

§ 5.3.4 The Contractor shall assure the Owner that all agreements between the Contractor and its Subcontractor incorporate the provisions of Section 5.3.1 as necessary to preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the work to be performed by Subcontractors so that the subcontracting thereof will not prejudice such rights. The Contractor's assurance shall be in the form of an affidavit or in such other form as the Owner may approve. Upon request, the Contractor shall provide the Owner or Architect with copies of any or all subcontracts or purchase orders.

§ 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.

§ 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.

§ 5.4.4 Each subcontract shall specifically provide that the Owner shall only be responsible to the subcontractor for those obligations of the Contractor that accrue subsequent to the Owner's exercise of any rights under this conditional assignment.

§ 5.4.5 Each subcontract shall specifically provide that the Subcontractor agrees to perform portions of the Work assigned to the Owner in accordance with the Contract Documents.

§ 5.4.6 Nothing in this Section 5.4 shall act to reduce or discharge the Contractor's payment bond surety's obligations to claimants for claims arising prior to the Owner's exercise of any rights under this conditional assignment.

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

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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 Reserved

§ 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.

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

§ 7.1.4 If a change in the Work provides for an adjustment to the Contract Sum, the amount of such adjustment must be computed and documented in writing. In order to facilitate evaluation of proposals or claims for increases and decreases to the Contract Sum, all proposals or claims, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized. Where major cost items are subcontracts, they shall be itemized also. The amount of the adjustment must approximate the actual cost to the Contractor and all costs incurred by the Contractor must be justifiably compared with prevailing industry standards. Except as provided in Section 7.1.5, all adjustments to the Contract Sum shall be limited to job specific costs and shall not include indirect costs, home office overhead or profit.

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

.1 For the Contractor, for Work performed by the Contractor's own forces, not to exceed seventeen (17%) percent of the Contractor's actual costs.

.2 For the Contractor, for Work performed by the Contractor's Subcontractors, not to exceed ten (10%) percent of each Subcontractor's actual costs (not including the Subcontractor's overhead and profit).

.3 For each Subcontractor involved, for Work performed by that Subcontractor's own forces, not to exceed seventeen (17%) percent of the Subcontractor's actual costs.

.4 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

The percentages cited above shall be considered to include all indirect costs including, but not limited to field and office managers, supervisors and assistants, incidental job burdens, small tools, and general overhead allocations.

§ 7.1.6 The procedures described in Sections 7.1.4 and 7.1.5 shall be used to calculate any adjustment in the Contract Sum, including without limitation an adjustment permitted under Articles 7, 9, 14, or 15.

§ 7.1.7 If a change in the Work requires an adjustment to the Contract Sum that exceeds the limits of the Owner's Construction Change Order Certification (reference Section 9.1.9 of the Agreement), then the Owner's agreement is not effective, and Work may not proceed until approved in writing by the OSE.

§ 7.1.8 Additional Work performed after the declaration of Substantial Completion must be approved by OSE, if the Change Order exceeds the Owner's Construction Change Order Certification.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument, using the OSE Construction Change Order form, 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.

Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work that is the subject of the Change Order, including, but not limited to, any adjustments to the Contract Sum or the Contract Time.

§ 7.2.2 At the Owner's request, the Contractor shall prepare a proposal to perform the work of a proposed Change Order setting forth the amount of the proposed adjustment, if any, in the Contract Sum; and the extent of the proposed adjustment, if any, in the Contract Time. Any proposed adjustment in the Contract Sum shall be prepared in accordance with Section 7.1.4 and 7.1.5. The Owner's request shall include any revisions to the Drawings or Specifications necessary to define any changes in the Work. Within fourteen (14) days of receiving the request, the Contractor shall submit the proposal to the Owner and Architect along with all documentation required by Section 7.5.

§ 7.2.3 If the Contractor requests a Change Order, the request shall set forth the proposed change in the Work and shall be prepared in accordance with Section 7.2.2. If the Contractor requests a change to the Work that involves a revision

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to either the Drawings or Specifications, the Contractor shall reimburse the Owner for any expenditure associated with the Architects' review of the proposed revisions, except to the extent the revisions are accepted by execution of a Change Order.

§ 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 if properly itemized and substantiating data is not available to permit evaluation;

.2 Unit prices specified in the Contract Documents or subsequently agreed upon, subject to adjustment if any, as provided in Section 9.1.2;

.3 Cost and a percentage fee, calculated as described in Sections 7.1.4 and 7.1.5;

.4 in another manner as the parties may agree; or

.5 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 make an initial determination, consistent with Section 7.3.3, of the method and 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 Section 7.1.5. 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; and

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related 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 cost including overhead and profit as confirmed by the Architect from the Schedule of Values.

§ 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

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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.

§ 7.5 Pricing Data and Audit

§ 7.5.1 Cost or Pricing Data

Upon request of the Owner or Architect, Contractor shall submit cost or pricing data prior to execution of a Modification which exceeds $500,000 [Reference S.C. Code Ann. §§ 11-35-1830 and 11-35-2220, and SC Code Ann. Reg 19-445.2120]. Contractor shall certify that, to the best of its knowledge and belief, the cost or pricing data submitted is accurate, complete, and current as of a mutually determined specified date prior to the date of pricing the Modification. Contractor's price, including profit, shall be adjusted to exclude any significant sums by which such price was increased because Contractor furnished cost or pricing data that was inaccurate, incomplete, or not current as of the date specified by the parties. Notwithstanding Subparagraph 9.10.4, such adjustments may be made after final payment to the Contractor.

§ 7.5.2 Cost or pricing data means all facts that, as of the date specified by the parties, prudent buyers and sellers would reasonably expect to affect price negotiations significantly. Cost or pricing data are factual, not judgmental; and are verifiable. While they do not indicate the accuracy of the prospective contractor's judgment about estimated future costs or projections, they do include the data forming the basis for that judgment. Cost or pricing data are more than historical accounting data; they are all the facts that can be reasonably expected to contribute to the soundness of estimates of future costs and to the validity of determinations of costs already incurred.

§ 7.5.3 Records Retention

As used in Section 7.5, the term "Records" means any books or records that relate to cost or pricing data of a Change Order that Contractor is required to submit pursuant to Section 7.5.1. Contractor shall maintain records for three years from the date of final payment, or longer if requested by the chief procurement officer. The Owner may audit Contractor's records at reasonable times and places.

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.

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§ 8.2.2 The Contractor shall not knowingly commence the Work prior to the effective date of surety bonds and 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 dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then to the extent such delay will prevent the Contractor from achieving Substantial Completion within the Contract Time, the Contract Time shall be extended for such reasonable time as the Architect may determine, provided the delay:

.1 is not caused by the fault or negligence of the Contractor or a subcontractor at any tier, and

.2 is not due to unusual delay in the delivery of supplies, machinery, equipment, or services when such supplies, machinery, equipment, or services were obtainable from other sources in sufficient time for the Contractor to meet the required delivery.

§ 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

§ 9.2.1 The Contractor shall submit a schedule of values to the Architect within ten (10) days of full execution of the Agreement, 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.

§ 9.2.2 As requested by the Architect, the Contractor and each Subcontractor shall prepare a trade payment breakdown for the Work for which each is responsible. The breakdown, being submitted on a uniform standardized format approved by the Architect and Owner, shall be divided in detail, using convenient units, sufficient to accurately determine the value of completed Work during the course of the Project. The Contractor shall update the schedule of values as required by either the Architect or Owner as necessary to reflect:

.1 the description of Work (listing labor and material separately);

.2 the total value of the Work;

.3 the percent and value of the Work completed to date;

.4 the percent and value of previous amounts billed; and

.5 the current percent completed, and amount billed.

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§ 9.2.3 Any schedule of values or trade breakdown that fails to provide sufficient detail, is unbalanced, or exhibits "front-loading" of the value of the Work shall be rejected. If a schedule of values or trade breakdown is used as the basis for payment and later determined to be inaccurate, sufficient funds shall be withheld from future Applications for Payment to ensure an adequate reserve (exclusive of normal retainage) to complete the Work.

§ 9.3 Applications for Payment

§ 9.3.1 Monthly, 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 as 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, provided such materials or equipment will be subsequently incorporated in the Work. 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. The Contractor shall 1) protect such materials from diversion, vandalism, theft, destruction, and damage, 2) mark such materials specifically for use on the Project, and 3) segregate such materials from other materials at the storage facility. The Architect and the Owner shall have the right to make inspections of the storage areas at any time.

§ 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 in both the Application for Payment and, if required to be submitted, the accompanying current construction schedule, 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,

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methods, techniques, sequences, or procedures; or (3) 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 shall 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. The Architect shall withhold a Certificate of Payment if the Application for Payment is not accompanied by the current construction schedule required by Section 3.10.1. 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 Pursuant to S.C. Ann. §§ 29-6-10 through 29-6-60, 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.

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§ 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 to the Owner, 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 time established in the Contract Documents, the amount certified by the Architect or awarded by final dispute resolution order, 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 written 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, the Owner, and any other party the Architect or the Owner choose, will make an inspection on a date and at a time mutually agreeable to determine whether the Work or designated portion thereof is substantially complete. The Contractor shall furnish access for the inspection and testing as provided in this Contract. The inspection shall include a demonstration by the Contractor that all equipment, systems and operable components of the Work function properly and in accordance with the Contract Documents.

.1 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.

.2 If more than one Substantial Completion inspection is required, the Contractor shall reimburse the Owner for all costs of re-inspections or, at the Owner's option, the costs may be deducted from payments due to the Contractor.

.3 Representatives of the State Fire Marshal's Office and other authorities having jurisdiction may be present at the Substantial Completion inspection or otherwise inspect the completed Work and advise the Owner whether the Work meets their respective requirements for the Project.

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§ 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 for its written acceptance of responsibilities assigned in the Certificate and a copy of the signed Certificate shall be delivered to the Contractor. Upon such acceptance, 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.

§ 9.8.6 If the Architect and Owner concur in the Contractor's assessment that the Work or a portion of the Work is safe to occupy, the Owner and Contractor may arrange for a Certificate of Occupancy inspection by OSE. The Owner, Architect, and Contractor shall be present at OSE's inspection. Upon verifying that the Work or a portion of the Work is substantially complete and safe to occupy, OSE will issue, as appropriate, a Full or Partial Certificate of Occupancy.

§ 9.8.7 The Owner may not occupy the Work until all required occupancy permits, if any, have been issued and delivered to the Owner.

§ 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 Unless the parties agree otherwise in the Certificate of Substantial Completion, the Contractor shall achieve Final Completion within thirty days after Substantial Completion. 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, the Owner, and any other party the Architect or the Owner choose will make an inspection on a date and at a time mutually agreeable. 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.

.1 If more than one Final Completion inspection is required, the Contractor shall reimburse the Owner for all costs of re-inspections or, at the Owner's option, the costs may be deducted from payments due to the Contractor.

.2 If the Contractor does not achieve Final Completion within thirty days after Substantial Completion or the timeframe agreed to by the parties in the Certificate of Substantial Completion, whichever is

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greater, the Contractor shall be responsible for any additional Architectural fees resulting from the delay.

.3 If OSE has not previously issued a Certificate of Occupancy for the entire Project, the Parties shall arrange for a representative of OSE to participate in the Final Completion inspection.

§ 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,

.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,

.7 required Training Manuals,

.8 equipment Operations and Maintenance Manuals,

.9 any certificates of testing, inspection or approval required by the Contract Documents and not previously provided, and

10. one copy of the Documents required by Section 3.11.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is delayed 60 days 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 specific claims in stated amounts that have been 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

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.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 which was not discoverable as provided in Section 3.2.1 and not addressed in the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons or serious loss to real or personal property resulting from such a material or substance 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. Hazardous materials or substances are those hazardous, toxic, or radioactive materials or substances subject to regulations by applicable governmental authorities having jurisdiction, such as, but not limited to, the S.C. Department of Health and Environmental Control, the U.S. Environmental Protection Agency, and the U.S. Nuclear Regulatory Commission.

§ 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

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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. In the absence of agreement, the Architect will make an interim determination regarding any delay or impact on the Contractor's additional costs. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the rights of either party to disagree and assert a Claim in accordance with Article 15.

§ 10.3.3 The Work in the affected area shall be resumed immediately following the occurrence of any one of the following events: (a) the Owner causes remedial work to be performed that results in the absence of hazardous materials or substances; (b) the Owner and the Contractor, by written agreement, decide to resume performance of the Work; or (c) the Work may safely and lawfully proceed, as determined by an appropriate governmental authority or as evidenced by a written report to both the Owner and the Contractor, which is prepared by an environmental engineer reasonably satisfactory to both the Owner and the Contractor.

§ 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 In addition to its obligations under Section 3.18, 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 Reserved

§ 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. The Contractor shall immediately give the Owner and Architect notice of the emergency. This initial notice may be oral followed within five (5) days by a written notice setting forth the nature and scope of the emergency. Within fourteen (14) days of the start of the emergency, the Contractor shall give the Architect a written estimate of the cost and probable effect of delay on the progress of the Work.

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 Failure to Purchase Required Property Insurance. If the Contractor 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

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Contract Documents, the Contractor shall inform the Owner in writing prior to commencement of the Work. Upon receipt of notice from the Contractor, the Owner may delay commencement of the Work and may obtain insurance that will protect the interests of the Owner in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall not be equitably adjusted. In the event the Contractor fails to procure coverage, the Contractor waives all rights against the Owner to the extent the loss to the Contractor (including Subcontractors and Sub-subcontractors) would have been covered by the insurance to have been procured by the Contractor. The cost of the insurance shall be charged to the Contractor by a Change Order. If the Contractor does not provide written notice, and the Owner is damaged by the failure or neglect of the Contractor to purchase or maintain the required insurance, the Contractor shall reimburse the Owner for all reasonable costs and damages attributable thereto.

§ 11.1.5 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 and all additional insureds of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Owner: (1) the Owner, upon receipt of notice from the Contractor, 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 not be equitably adjusted; and (3) the Contractor waives all rights against the Owner to the extent any loss to the Contractor, Subcontractors, and Sub-subcontractors would have been covered by the insurance had it not expired or been cancelled. If the Owner purchases replacement coverage, the cost of the insurance shall be charged to the Contractor by an appropriate Change Order. 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 Reserved

§ 11.2.3 Reserved

§ 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.

§ 11.3.3 Limitation on the Owner's Waiver of Subrogation

South Carolina law prohibits the State from indemnifying a private party. Accordingly, and notwithstanding anything in the Agreement to the contrary, including but not limited to Sections 11.3.1, 11.3.2. and 11.4, the Owner cannot and

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does not waive subrogation to the extent any losses are covered by insurance provided by the South Carolina Insurance Reserve Fund.

§ 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 Contractors as fiduciary and made payable to the Contractor 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 Contractor shall pay the Architect and Owner their just shares of insurance proceeds received by the Contractor, and by appropriate agreements the Architect and Owner shall make payments to their consultants and separate contractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Contractor shall notify the Owner of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Owner shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Owner does not object, the Contractor shall settle the loss and the Owner shall be bound by the settlement and allocation. Upon receipt, the Contractor 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 Owner timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Contractor 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.

§ 11.5.3 If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor.

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 requirements specifically expressed in the Contract Documents, including inspections of work-in-progress required by all authorities having jurisdiction over the Project, it must, upon demand of the Architect or authority having jurisdiction, be uncovered for observation/inspection 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 unless the condition was caused by the Owner or a Separate Contractor in which event the Owner shall be responsible for payment of such costs.

§ 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.

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.1 If the Contractor, a Subcontractor, or anyone for whom either is responsible, uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment, or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

§ 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. 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 unless otherwise provided in the Contract Documents.

§ 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

§ 13.1.1 The Contract, any dispute, claim, or controversy relating to the Contract, and all the rights and obligations of the parties shall, in all respects, be interpreted, construed, enforced and governed by and under the laws of the State of South Carolina, except its choice of law rules.

§ 13.1.2 This Contract is formed pursuant to and governed by the South Carolina Consolidated Procurement Code and is deemed to incorporate all applicable provisions thereof and the ensuing regulations.

§ 13.2 Successors and Assigns

The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract as a whole, or in part, without written consent of the other and then only in accordance with and as permitted by Regulation 19-445.2180 of the South Carolina Code of Regulations, as amended. If either party attempts

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to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.3 Rights and Remedies

§ 13.3.1 Unless expressly provided otherwise, 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.

§ 13.3.3 Notwithstanding Section 9.10.4, the rights and obligations which, by their nature, would continue beyond the termination, cancellation, rejection, or expiration of this contract shall survive such termination, cancellation, rejection, or expiration, including, but not limited to, the rights and obligations created by the following clauses:

1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service;
3.5 Warranty
3.17 Royalties, Patents and Copyrights
3.18 Indemnification
7.5 Pricing Data and Audit
A.3.2.2 Contractor's Liability Insurance (A101, Exhibit A)
A.3.5 Performance and Payment Bond (A101, Exhibit A)
15.1.7 Claims for Listed Damages
15.1.8 Waiver of Claims Against the Architect
15.6 Dispute Resolution
15.6.5 Service of Process

§ 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 Owner and Architect timely notice of when and where tests and inspections are to be made so that they 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.

.1 Inspection, Special Inspections, and testing requirements, if any, as required by the ICC series of Building Codes shall be purchased by the Owner.

.2 Contractor shall schedule and request inspections in an orderly and efficient manner and shall notify the Owner whenever the Contractor schedules an inspection. Contractor shall be responsible for the cost of inspections scheduled and conducted without the Owner's knowledge and for any increase in the cost of inspections resulting from the inefficient scheduling of inspections.

§ 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 Owner and 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 and shall be deducted from future Applications of Payment.

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§ 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 to the Contractor and unpaid under the Contract Documents shall bear interest only if and to the extent allowed by S.C. Code Ann. §§ 29-6-10 through 29-6-60. Amounts due to the Owner shall bear interest at the rate of one percent a month or a pro rata fraction thereof on the unpaid balance as may be due.

§ 13.6 Procurement of Materials by Owner

The Contractor accepts assignment of all purchase orders and other agreements for procurement of materials and equipment by the Owner that are identified as part of the Contract Documents. The Contractor shall, upon delivery, be responsible for the storage, protection, proper installation, and preservation of such Owner purchased items, if any, as if the Contractor were the original purchaser. The Contract Sum includes, without limitation, all costs and expenses in connection with delivery, storage, insurance, installation, and testing of items covered in any assigned purchase orders or agreements. Unless the Contract Documents specifically provide otherwise, all Contractor warranty of workmanship and correction of the Work obligations under the Contract Documents shall apply to the Contractor's installation of and modifications to any Owner purchased items.

§ 13.7 Interpretation of Building Codes

As required by S.C. Code Ann. § 10-1-180, OSE shall determine the enforcement and interpretation of all building codes and referenced standards on state buildings. The Contractor shall refer any questions, comments, or directives from local officials to the Owner and OSE for resolution.

§ 13.8 Minority Business Enterprises

Contractor shall notify Owner of each Minority Business Enterprise (MBE) providing labor, materials, equipment, or supplies to the Project under a contract with the Contractor. Contractor's notification shall be via the first monthly status report submitted to the Owner after execution of the contract with the MBE. For each such MBE, the Contractor shall provide the MBE's name, address, and telephone number, the nature of the work to be performed or materials or equipment to be supplied by the MBE, whether the MBE is certified by the South Carolina Office of Small and Minority Business Assistance, and the value of the contract.

§ 13.9 Illegal Immigration

Contractor certifies and agrees that it will comply with the applicable requirements of Title 8, Chapter 14 of the South Carolina Code of Laws and agrees to provide to the State upon request any documentation required to establish either: (a) that Title 8, Chapter 14 is inapplicable both to Contractor and its subcontractors or sub-subcontractors; or (b) that Contractor and its subcontractors or sub-subcontractors are in compliance with Title 8, Chapter 14. Pursuant to Section 8-14-60, "A person who knowingly makes or files any false, fictitious, or fraudulent document, statement, or report pursuant to this chapter is guilty of a felony and, upon conviction, must be fined within the discretion of the court or imprisoned for not more than five years, or both." Contractor agrees to include in any contracts with its subcontractor's language requiring its subcontractors to (a) comply with the applicable requirements of Title 8, Chapter 14, and (b) include in their contracts with the sub-subcontractor's language requiring the sub-subcontractors to comply with the applicable requirements of Title 8, Chapter 14. (An overview is available at www.procurement.sc.gov)

§ 13.10 Drug-Free Workplace

The Contractor must comply with the Drug-Free Workplace Act, S.C. Code Ann. §§ 44-107-10, et seq. The Contractor certifies to the Owner that Contractor will provide a Drug-Free Workplace, as defined by S.C. Code Ann. § 44-107-20(1).

§ 13.11 False Claims

According to S.C. Code Ann. § 16-13-240, "a person who by false pretense or representation obtains the signature of a person to a written instrument or obtains from another person any chattel, money, valuable security, or other property, real or personal, with intent to cheat and defraud a person of that property is guilty" of a crime.

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§ 13.12 Prohibited Acts

It is unlawful for a person charged with disbursements of state funds appropriated by the General Assembly to exceed the amounts and purposes stated in the appropriations. (§ 11-9-20) It is unlawful for an authorized public officer to enter into a contract for a purpose in which the sum is in excess of the amount appropriated for that purpose. It is unlawful for an authorized public officer to divert or appropriate the funds arising from any tax levied and collected for any one fiscal year to the payment of an indebtedness contracted or incurred for a previous year. (§ 11-1-40)

§ 13.13 Open Trade (Jun 2015)

During the contract term, including any renewals or extensions, Contractor will not engage 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 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 45 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 substantially all Work to be stopped; or

.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 and the Contractor has stopped work in accordance with Section 9.7.

§ 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, 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 persistently 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, or otherwise fails to prosecute the Work, or any separable part of the Work, with the diligence, resources and skill that will ensure its completion within the time specified in the Contract Documents, including any authorized adjustments;

.2 fails to make payment to Subcontractors or suppliers in accordance with the Contract Documents and 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, 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:

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.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 Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 If, after termination for cause, it is determined that the Owner lacked justification to terminate under Section 14.2.1, or that the Contractor's default was excusable, or that the termination for cause was affected by any other error, then Owner and Contractor agree that the termination shall be conclusively deemed to be one for the convenience of the Owner, and the rights and obligations of the parties shall be the same as if the termination had been issued for in Section 14.4.

§ 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. 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 in whole or in part for the Owner's convenience and without cause. The Owner shall give notice of the termination to the Contractor specifying the part of the Contract terminated and when termination becomes effective.

§ 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;
.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; and
.4 complete the performance of the Work not terminated, if any.

§ 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 any other adjustments otherwise set forth in the Agreement.

§ 14.4.4 Contractor's failure to include an appropriate termination for convenience clause in any subcontract shall not (i) affect the Owner's right to require the termination of a subcontract, or (ii) increase the obligation of the Owner beyond what it would have been if the subcontract had contained an appropriate clause.

§ 14.4.5 Upon written consent of the Contractor, the Owner may reinstate the terminated portion of this Contract in whole or in part by amending the notice of termination if it has been determined that:
.1 the termination was due to withdrawal of funding by the General Assembly, Governor, or State Fiscal Accountability Authority or the need to divert project funds to respond to an emergency as defined by Regulation 19-445.2110(B) of the South Carolina Code of Regulations, as amended;

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.2 funding for the reinstated portion of the Work has been restored;
.3 circumstances clearly indicate a requirement for the terminated Work; and
.4 reinstatement of the terminated work is advantageous to the Owner.

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. A voucher, invoice, payment application or other routine request for payment that is not in dispute when submitted is not a Claim under this definition. 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 Reserved

§ 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 Architect. Such notice shall include sufficient information to advise the Architect and other party of the circumstances giving rise to the Claim, the specific contractual adjustment or relief requested and the basis of such request. 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 except as stated for adverse weather days in Section 15.1.6.2. By failing to give written notice of a Claim within the time required by this Section, a party expressly waives its Claim.

§ 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 Architect is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, including any administrative review allowed under Section 15.6, 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 Architect'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. Claims for an increase in the Contract Time shall be based on one additional calendar day for each full calendar day that the Contractor is prevented from working.

§ 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.

.1 Claims for adverse weather shall be based on actual weather conditions at the job site or other place of performance of the Work, as documented in the Contractor's job site log.

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.2 For the purpose of this Contract, a total of five (5) days per calendar month (non-cumulative) shall be anticipated as "adverse weather" at the job site, and such time will not be considered justification for an extension of time. If, in any month, adverse weather develops beyond the five (5) days, the Contractor shall be allowed to claim additional days to compensate for the excess weather delays only to the extent of the impact on the approved construction schedule and days the Contractor was already scheduled to work. The remedy for this condition is for an extension of time only and is exclusive of all other rights and remedies available under the Contract Documents or imposed or available by law.

.3 The Contractor shall submit monthly with their pay application all Claims for adverse weather conditions that occurred during the previous month. The Architect shall review each monthly submittal in accordance with Section 15.5 and inform the Contractor and the Owner promptly of its evaluation. Approved days shall be included in the next Change Order issued by the Architect. Adverse weather conditions not claimed within the time limits of this Subparagraph shall be considered to be waived by the Contractor. Claims will not be allowed for adverse weather days that occur after the scheduled (original or adjusted) date of Substantial Completion.

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

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

§ 15.1.7 Claims for Listed Damages

Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor and Owner waive Claims against each other for listed damages arising out of or relating to this Contract.

§ 15.1.7.1 For the Owner, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) costs suffered by a third party unable to commence work, (vi) attorney's fees, (vii) any interest, except to the extent allowed by Section 13.5 (Interest), (viii) lost revenue and profit for lost use of the property, (ix) costs resulting from lost productivity or efficiency.

§ 15.1.7.2 For the Contractor, listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) attorney's fees, (vi) any interest, except to the extent allowed by Section 13.5 (Interest); (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. Without limitation, this mutual waiver is applicable to all damages due to either party's termination in accordance with Article 14.

§ 15.1.7.3 Nothing contained in this Section shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

§ 15.1.8 Waiver of Claims Against the Architect

Notwithstanding any other provision of the Contract Documents, including Section 1.2.1, but subject to a duty of good faith and fair dealing, the Contractor waives all claims against the Architect and any other design professionals who provide design and/or project management services to the Owner, either directly or as independent contractors or subcontractors to the Architect, for listed damages arising out of or relating to this Contract. The listed damages are (i) lost revenue and profit, (ii) losses resulting from injury to business or reputation, (iii) additional or escalated overhead and administration expenses, (iv) additional financing costs, (v) attorney's fees, (vi) any interest; (vii) unamortized equipment costs; and, (viii) losses incurred by subcontractors for the types of damages the Contractor has waive as against the Owner. This mutual waiver is not applicable to amounts due or obligations under Section 3.18 (Indemnification).

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§ 15.2 Reserved

§ 15.3 Reserved

§ 15.4 Reserved

§ 15.5 Claim and Disputes - Duty of Cooperation, Notice, and Architects Initial Decision

§ 15.5.1 Contractor and Owner are fully committed to working with each other throughout the Project to avoid or minimize Claims. To further this goal, Contractor and Owner agree to communicate regularly with each other and the Architect at all times notifying one another as soon as reasonably possible of any issue that if not addressed may cause loss, delay, and/or disruption of the Work. If Claims do arise, Contractor and Owner each commit to resolving such Claims in an amicable, professional, and expeditious manner to avoid unnecessary losses, delays, and disruptions to the Work.

§ 15.5.2 Claims shall first be referred to the Architect for initial decision. An initial decision shall be required as a condition precedent to resolution pursuant to Section 15.6 of any Claim arising prior to the date of final payment, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered, or after all the Architect's requests for additional supporting data have been answered, whichever is later. The Architect will not address Claims between the Contractor and persons or entities other than the Owner.

§ 15.5.3 The Architect will review Claims and within ten days of the receipt of a Claim (1) request additional supporting data from the claimant or a response with supporting data from the other party or (2) render an initial decision in accordance with Section 15.5.5.

§ 15.5.4 If the Architect 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 such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Architect when the response or supporting data will be furnished or (3) advise the Architect that all supporting data has already been provided. Upon receipt of the response or supporting data, the Architect will render an initial decision in accordance with Section 15.5.5.

§ 15.5.5 The Architect will render an initial decision in writing; (1) stating the reasons therefor; and (2) notifying the parties of any change in the Contract Sum or Contract Time or both. The Architect will deliver the initial decision to the parties within two weeks of receipt of any response or supporting data requested pursuant to Section 16.4 or within such longer period as may be mutually agreeable to the parties. If the parties accept the initial decision, the Architect shall prepare a Change Order with appropriate supporting documentation for the review and approval of the parties and the Office of State Engineer. If either the Contractor, Owner, or both, disagree with the initial decision, the Contractor and Owner shall proceed with dispute resolution in accordance with the provisions of Section 15.6.

§ 15.5.6 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.

§ 15.6 Dispute Resolution

§ 15.6.1 If a Claim is not resolved pursuant to Section 15.5 to the satisfaction of either party, both parties shall attempt to resolve the dispute at the field level through discussions between Contractor's Representative and Owner's Representative. If a dispute cannot be resolved through Contractor's Representative and Owner's Representative, then the Contractor's Senior Representative and the Owner's Senior Representative, upon the request of either party, shall meet as soon as conveniently possible, but in no case later than twenty-one (21) days after such a request is made, to attempt to resolve such dispute. Prior to any meetings between the Senior Representatives, the parties will exchange relevant information that will assist the parties in resolving their dispute. The meetings required by this Section are a condition precedent to resolution pursuant to Section 15.6.2.

§ 15.6.2 If after meeting in accordance with the provisions of Section 15.6.1, the Senior Representatives determine that the dispute cannot be resolved on terms satisfactory to both the Contractor and the Owner, then either party may submit the dispute by written request to South Carolina's Chief Procurement Officer for Construction (CPOC). Except as otherwise provided in Article 15, all Claims, or controversies relating to the Contract shall be resolved exclusively by the appropriate Chief Procurement Officer in accordance with Title 11, Chapter 35, Article 17 of the

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South Carolina Code of Laws, or in the absence of jurisdiction, only in the Court of Common Pleas for, or in the absence of jurisdiction a federal court located in, Richland County, State of South Carolina. Contractor agrees that any act by the State regarding the Contract is not a waiver of either the State's sovereign immunity or the State's immunity under the Eleventh Amendment of the United States Constitution.

§ 15.6.3 If any party seeks resolution to a dispute pursuant to Section 15.6.2, the parties shall participate in non-binding mediation to resolve the Claim. If the Claim is governed by Title 11, Chapter 35, Article 17 of the South Carolina Code of Laws as amended and the amount in controversy is $100,000.00 or less, the CPOC shall appoint a mediator, otherwise, the mediation shall be conducted by an impartial mediator selected by mutual agreement of the parties, or if the parties cannot so agree, a mediator designated by the American Arbitration Association ("AAA") pursuant to its Construction Industry Mediation Rules. The mediation will be governed by and conducted pursuant to a mediation agreement negotiated by the parties or, if the parties cannot so agree, by procedures established by the mediator.

§ 15.6.4 Without relieving any party from the other requirements of Sections 15.5 and 15.6, either party may initiate proceedings in the appropriate forum prior to initiating or completing the procedures required by Sections 15.5 and 15.6 if such action is necessary to preserve a claim by avoiding the application of any applicable statutory period of limitation or repose.

§ 15.6.5 Service of Process

Contractor consents that any papers, notices, or process necessary or proper for the initiation or continuation of any Claims, or controversies relating to the Contract; for any court action in connection therewith; or for the entry of judgment on any award made, may be served on Contractor by certified mail (return receipt requested) addressed to Contractor at the address provided for the Contractor's Senior Representative or by personal service or by any other manner that is permitted by law, in or outside South Carolina. Notice by certified mail is deemed duly given upon deposit in the United States mail.

ARTICLE 16 PROJECT-SPECIFIC REQUIREMENTS AND INFORMATION

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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: Midlands Technical College

Address: 1260 Lexington Drive

West Columbia, S.C. 29170

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: AMSC Expansion - Airport

State Project Number: H59-N301-PG

Brief Description of Awarded Work: A new one-story enclosed three-bay space housing an Assembly Shop. The existing Construction Program Room is full renovated to accommodate a new classroom, two shops and an attic storage. Existing expoxy concrete slab coating is removed. Assocaited electrical, mechanical, plumbing, fire protection systems are included to support the new addtion and renovated space. Reuse, demolition and replacement of the existing items, including but not limited to welding fan, fence, lighting fixtures, sprinkler system, are included.

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: Goodwyn Mills Cawood, LLC (GMC)

Address: 915 Lady St. Suite C

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 si 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: Midlands Technical College

Address: 1260 Lexington Drive

West Columbia, S.C. 29170

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: AMSC Expansion - Airport

State Project Number: H59-N301-**SB**

Brief Description of Awarded Work: A new one-story enclosed three-bay space housing an Assembly Shop. The existing Construction Program Room is full renovated to accommodate a new classroom, two shops and an attic storage. Existing expoxy concrete slab coating is removed. Assocaited electrical, mechanical, plumbing, fire protection systems are included to support the new addtion and renovated space. Reuse, demolition and replacement of the existing items, including but not limited to welding fan, fence, lighting fixtures, sprinkler system, are included.Goodwyn Mills Cawood, LLC (GMC)

in accordance with Drawings and Specifications prepared by *(Insert full name and address of A/E)*

Name: Goodwyn Mills Cawood, LLC (GMC)

Address: 915 Lady St. Suite C

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	**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-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 o ne 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: Midlands Technical College

PROJECT NAME: AMSC Expansion - Airport

PROJECT NUMBER: H59-N301-SB

CONTRACTOR: _____

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.	**Initial Date for Substantial Completion:**		
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 Date for Substantial Completion:**		

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

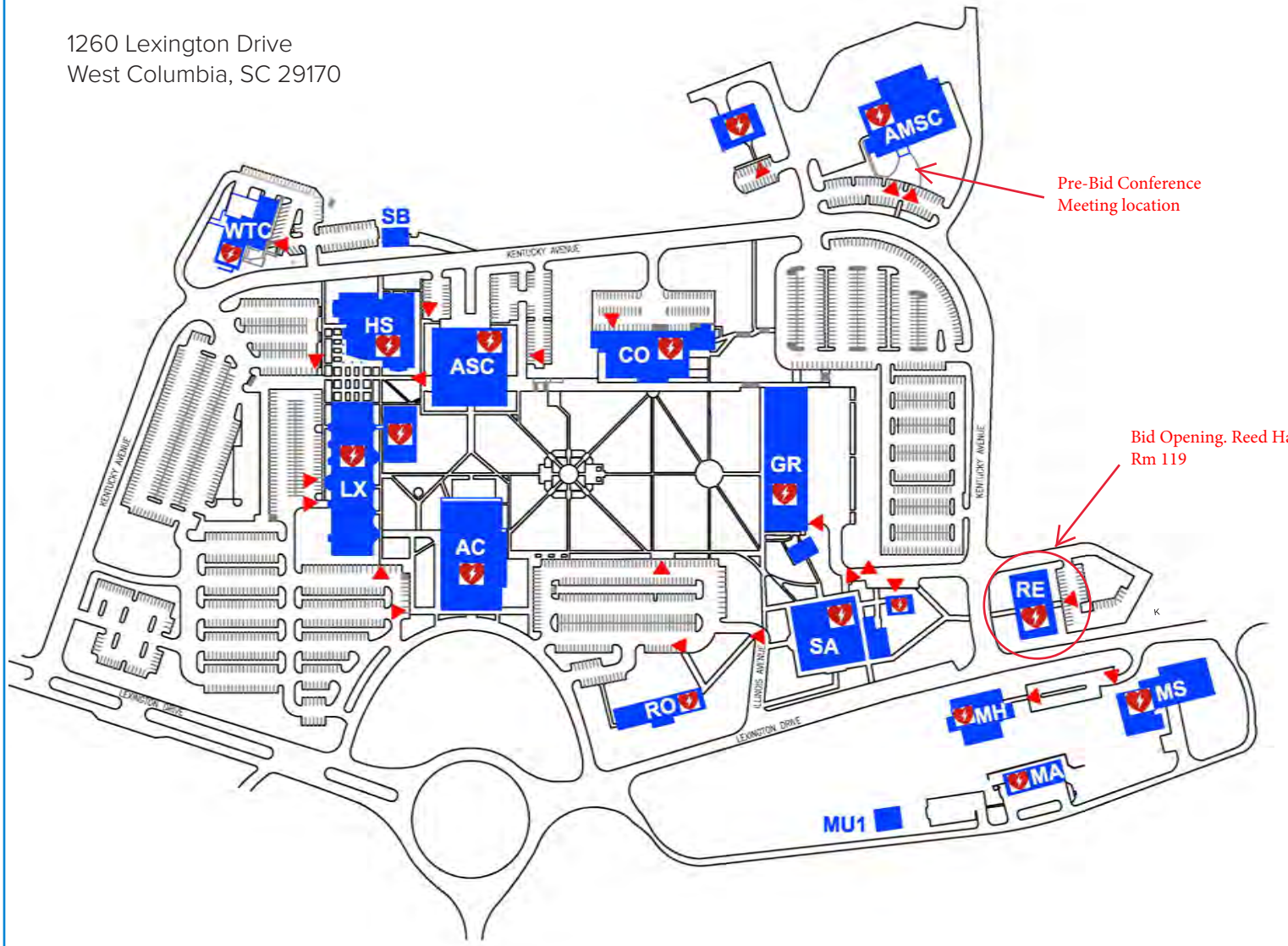
1. SE-380, completed and signed by the Agency.
2. SE-380, Page 2, completed and signed by the Contractor, A/E and Agency, with back-up information to support request.

BUILDING LOCATION MAP

AIRPORT CAMPUS

MIDLANDS TECHNICAL COLLEGE

1260 Lexington Drive
West Columbia, SC 29170



Building Legend Airport Campus

AC - Academic Center
AMSC - Advanced Manufacturing and Skilled Crafts Center
ASC - Airport Student Center
CO - Congaree Hall
GR - Granby Hall
HS - Health Science Building
LB - Lab Building
LX - Lexington Hall
MA - Maintenance Building
MH - Morris Hall
MS - Materials Support Facility
MU1 - Mobile Unit #1
OP - Operations
RE - Reed Hall
RO - Robinson Building
SDH - Springdale Hall
SA - Saluda Hall
SB - Storage Building
WETC - Welding Technology Center

▲ Curb access ramps for students with disabilities

AED Location

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Owner-furnished products.
3. Use of premises.
4. Work restrictions.
5. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: AMSC Center Addition and Renovations
1260 Lexington Drive,
West Columbia, SC, 29170

1. Architect's Project Number: ACOL240010
2. State Project Number: H59-N301-SB

B. Owner: Midlands Technical College

C. Representative: Tommy Wise, Associate Director of Construction and Planning
(803) 822-6757
franklintwise@midlandstech.edu

D. Architect: Goodwyn Mills & Cawood
915 Lady Street, Suite C
Columbia, SC 29201.

1. Representative: Justin Lucas, AIA,
(251) 581-1905
justin.lucas@gmcnetwork.com

E. Summary of the work covered by the contract:

1. The project involves constructing a new one-story building through enclosing the existing four-bay canopy to serve as an Assembly Shop and a new three-bay canopy. The Tool Storage is priced as alternate #2.

2. Interior renovations include fully renovation of the existing Building Construction Room Existing lighting fixtures are demolished, and new mechanical, electrical, plumbing and fire protection systems will be installed. The new classroom with a ladder-access mezzanine for attic storage and adjacent plumbing fixtures are priced as alternate #1.

3. The existing mechanical yard is expanded for new equipment, with relocation and new fencing.

4. Surrounding site and associated utilities will be renovated, including the new one-story addition on the West facing (Plan-North) façade of the building, extending and rerouting sewer pipes outside the slab to connect to the existing sewer system, modifying grading at access points for accessibility.

1.4 WORK PHASES

A. The Work shall be conducted in one phase.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated.

1. Owner will arrange and pay for delivery of Owner-furnished / Owner Installed items according to Contractor's Construction Schedule.
   a. Owner Furnished Furniture
   b. Owner Furnished Equipment
2. Owner will furnish to the Contractor the earliest possible delivery date for Owner-furnished / Contractor Installed products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished / Contractor-Installed items in Contractor's Construction Schedule.
   a. Existing Equipment relocated to the existing facility shall be Owner Furnished / Contractor Installed. The contractor shall be responsible for moving the existing equipment from the current facility to the new facility and making all the necessary connections for water, power, waste as required for the equipment to be fully functional.

1.6 USE OF PREMISES

A. General: Contractor shall have unlimited use of the site for construction operations as indicated on Drawings by the Contract limits.

1. It is the responsibility of the Contractor to provide the necessary provisions to maintain a safe and secure construction site that is separate from the Midlands Technical College school activity including the following:
   a. Provide perimeter secure fencing.
   b. Provide / Construct secure outdoor secure fencing that direct students, faculty, staff and visitors to designated areas in a safe and secure manner. This includes protection from construction activity.
   c. Notify the Owner and the Architect of any interruptions to site utilities affecting Midlands Technical College operations. Provide a minimum of seven (7) day

advanced notice to the Owner / Architect prior to making changes to the site organization and safety / security provisions.

d. Notify the Owner and the Architect of changes to the site security as the work progresses. Changes in the site organization are permitted as work in areas is completed and access to other areas becomes necessary. Provide a minimum of seven (7) day advanced notice to the Owner / Architect prior to making changes to the site organization and safety / security provisions.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways and Entrances: Keep driveways, loading areas, 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 storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 OWNER'S OCCUPANCY REQUIREMENTS

A. Owner Occupancy: Owner / Midlands Technical College will occupy the existing adjacent buildings, roads and parking lots during the entire construction period. Cooperate with Owner / Midlands Technical College during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.

1. Maintain access to existing roads, driveways, walkways, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction unless indicated on the drawings as part of work phasing.

2. Noisy and/or disruptive work may be performed during normal working hours. Notify the Owner / Aiken Technical College of any work that is excessively noisy or disruptive.
   a. Limit noisy or disruptive work to be scheduled on testing days. Coordinate with the Owner / Aiken Technical College to schedule work accordingly to not disrupt testing days.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions the building, at the time of Substantial Completion of the Work, provided such occupancy does not interfere with Final Completion of the Work. Such placement of equipment shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for the completed work before Owner occupancy.

2. A Certificate of Occupancy / Use will be prepared by the Architect / Agency and shall be issued by the local Authority having Jurisdiction (OSE) prior to any Owner occupancy.

3. Before Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.

4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.8 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, except otherwise indicated.

1. Weekend Hours: As agreed during the preconstruction meeting.
2. Early Morning Hours: As agreed during the preconstruction meeting.
3. Hours for Utility Shutdowns: Seven (7) days prior written notice and Owner prior approval required.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner in writing not less than seven (7) days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. 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. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    a. 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.

C. 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 published as part of the U.S. National CAD Standard and scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 23 00 - 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. Review the related section associated with the work noted in each alternate.

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 schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate #1: Open-air Steel Structure Canopy and Concrete Slab

1. Base Bid: Scope describe below in Alternate not included in project.
2. Alternate Pricing: Provide an alternate price to provide and install New Canopy 104, including concrete slab, steel structure, standing seam metal roof system, gutter and downspouts, metal rake trim, dry-type sprinkler system, lighting fixtures and other items as noted. Reference drawings for additional information.

END OF SECTION 01 23 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.2 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, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within 7 days 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 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.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes 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 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.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Provide completed Form SE-380 – Pg. 2 ONLY with summary Cover sheet, cost breakdown and backup data. Forms have been included in project documents and can also be accessed via SCOSE website.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Contractor will issue a Change Order for signatures of Owner, Architect and Contractor on OSE Form SE-380 – Pg. 1. Multiple Change Order Requests can be combined to form a single change order. Forms have been included in project documents and can also be accessed via SCOSE website.

1.5 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on the AIA G714 form, Construction Change Directive. 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.
    a. If the change in the contract sum cannot be determined prior to the start of the work or if a delay in starting of the work would cause other delays to the project schedule, the Contractor shall perform the work described in the Change Directive and the Owner / Architect & Contractor will agree to the cost of the change after the work is complete.

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 01 26 00

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 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.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with Continuation Sheets.
    b. Submittals Schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than 14 days before the date scheduled for submittal of initial Applications for Payment.

3. Sub-schedules: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

3. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
5. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
6. Provide a separate line item for closeout documents. Value must be greater than or equal to .5% of the contract value.
7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each 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 Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
1. Submit **Draft Pay Application no later than the 25th of the Month** for review by the Owner and Architect.
2. The Invoice Date shall be the last day of the month.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

E. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
    a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule.
4. Schedule of unit prices.
5. Submittals Schedule.
6. List of Contractor's staff assignments.
7. Copies of building permits.
8. Certificates of insurance and insurance policies.
9. Performance and payment bonds.

G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

H. Final Payment Application: 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. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
3. AIA Document G707, "Consent of Surety to Final Payment."
4. Evidence that claims have been settled.
5. Transmittal of required Project construction records to the Owner.
6. Proof that taxes, fees, and similar obligations were paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish, and similar elements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Administrative and supervisory personnel.
4. Project meetings.
5. Requests for Interpretation (RFIs).

1.2 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

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.

B. 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.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and 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.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.
   c. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Key Personnel Names: Within 7 calendar days of starting construction operations, submit a list of principle staff assignments, including Field Superintendent and Project Manager for the Project to the owner for approval.

1. Submittal Form: As noted in the Series 0 Bidding Requirements and Contract Forms.
2. Provide all contact information including home and mobile phone numbers.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.6 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.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: 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: Attend a preconstruction conference scheduled by the Owner before starting construction.

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. All 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. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Procedures for processing field decisions and Change Orders.
f. Procedures for RFIs.
g. Procedures for testing and inspecting.
h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Quality control requirements.
l. Preparation of Record Documents.
m. Use of the premises.
n. Responsibility for temporary facilities and controls.
o. Parking availability.
p. Office, work, and storage areas.
q. Equipment deliveries and priorities.
r. First aid.
s. Security.
t. Progress cleaning.
u. Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. 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. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) RFI status.
5) Field report issues requiring action.
6) Deliveries.
7) Progress cleaning.
8) Quality and work standards.
9) Status of Change Orders.

2. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

E. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

C. Hard-Copy RFIs: Format to be provided by Contractor and approved by Architect.

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:
   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Architect's actions on submittals.
   f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.

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 Division 1 Section "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 10 days of receipt of the RFI response.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at each Project Meeting. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were dropped and not submitted.
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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Field condition reports.
6. Special reports.

B. Related Sections include the following:

1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.

1.2 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 activities are activities on the critical path. They 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. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. 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.

G. Fragment: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.3 SUBMITTALS

A. Qualification Data: For scheduling consultant.

B. Submittals Schedule: Submit four copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Architect's final release or approval.

C. Preliminary Construction Schedule: Submit four opaque copies.

1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

D. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

E. Contractor's Construction Schedule: Submit four opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

F. CPM Reports: Concurrent with CPM schedule, submit one copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

G. Daily Construction Reports: Submit four copies at monthly intervals.

H. Field Condition Reports: Submit four copies at time of discovery of differing conditions.

I. Special Reports: Submit four copies at time of unusual event.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
4. Review schedule for work of Owner's separate contracts.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review time required for completion and startup procedures.
8. Review and finalize list of construction activities to be included in schedule.
9. Review submittal requirements and procedures.
10. Review procedures for updating schedule.

1.5 PERFORMANCE MONITORING

A. Owner may elect throughout, or at any time during, the Project to record the number of workers and construction equipment working on each construction schedule activity in each area of the Project. Owner’s request for this information will be without additional cost to the project and shall be provided within five workdays of receipt of the Owner’s written request. This information will be used by the Owner to evaluate the adequacy of the Contractor’s performance and project manpower staffing, as well as any Contractor claims.

B. The Contractor is required to attend all construction coordination meetings. As such, the Contractor shall prepare a three-week rolling bar chart one week behind the date of the meeting depicting work completed, and three weeks look-ahead. The bar chart should be sorted by Area by Total Float. Information to be shown on the bar chart includes: Activity ID, Activity Description,

Original Duration, Remaining Duration, Percent Complete, Area Code, Responsibility Code, Early Start/Actual Start, Early Finish, and Total Float.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
   a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial 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.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Within 15 work days of Notice to Proceed, submit a Preliminary Schedule detailing planned work/operations for the first 90 calendar days of the Project with sufficient detail to allow progress payments to be made from the Preliminary Schedule while the Baseline Schedule is being developed and approved, and summary level activities representing major components of work included in the Contract for the balance of the Project performance period through to the Substantial Completion Date. All activities shown in the Preliminary Schedule shall be cost loaded, including the summary level activities.

B. The Preliminary Schedule shall be updated on a monthly basis and shall be consistent with the procedures and requirements described for Baseline Schedule.

C. Within 10 workdays of receipt by the Owner of the Preliminary Schedule, the Contractor and the Owner shall meet to discuss the results of Owner’s schedule review. To the extent that revisions are required, the Contractor shall resubmit the Preliminary Schedule to Owner for approval within five workdays of receipt of Owner’s comments.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.

d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
   b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.5 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.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial Completions and occupancies.
19. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Representative: Engage a qualified scheduling representative to provide planning, evaluation, and reporting using CPM scheduling.

1. Within five work days after the date of Notice to proceed, designate in writing an authorized scheduler or scheduling representative in the Contractor’s organization who shall be responsible for coordinating with the Owner during the preparation and maintenance of the Project Schedule.
2. Meetings: Scheduling representative shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Distribution: Distribute copies of approved schedule to Architect and Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 RESPONSIBILITY FOR COMPLETION

A. If, in the owner’s opinion, the Contractor falls behind the planned progress as noted by negative float shown on the current monthly Schedule Update, the Contractor shall take any and all steps necessary to improve its progress at no additional cost to the Project. This shall not be construed as prohibiting the contractor from increasing the number of working hours, shifts per day, working days per week, or the amount of construction equipment, or any combination of the foregoing, to eliminate the delay in the scheduled progress.

B. Failure of the contractor to comply with the Owner’s requirements above shall be grounds for determination by owner that the contractor is not prosecuting the work with such diligence as will ensure completion within the contract time. Upon such determination, Owner may recommend termination of the Contractor’s right to proceed with the work, or any separable part thereof, in accordance with the applicable provision of the Contract Documents.

3.3 PAYMENTS TO CONTRACTOR

A. Owner shall review the Contractor's monthly request for payment upon receipt and shall process the request for payment based upon the current approved Schedule Update within the time frame specified in the Contract Documents. Owner will consider the Contractor's overall progress toward Project Completion along with the progress for discrete activities to determine the amount to be approved for the monthly payment request.

END OF SECTION 01 32 00

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. See Division 1 Section “Construction Progress Documentation” for submitting schedules and reports, including Contractor’s Construction Schedule and Submittals Schedule.

C. See Division 1 Section “Quality Requirements” for submitting test and inspection reports.

D. See Division 1 Section “Closeout Procedures” for submitting warranties.

E. See Division 1 Section “Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.

F. See Division 1 Section “Operation and maintenance Data” for submitting operation and maintenance manuals.

G. See Division 1 Section “Demonstration and Training” for submitting videotapes of demonstration of equipment and training of owner’s personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 QUALITY ASSURANCE

A. General: Prepare and submit Submitttals required by individual Specification Sections.

1. Submittals shall be neat and legible, of uniform scale, responsive to requirements, with all sheets of similar information of same size.

2. Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor’s use in preparing submittals, upon approval of the Electronic Data Transfer Fee.

3. Facsimile copies will not be reviewed or accepted. No exceptions.

B. Resident Engineer Copies: Submit one copy of approved shop drawings prior to installing any equipment in the Project.

1.4 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.

1. Initial Review: Architect will review submittals with reasonable promptness as to cause no delay in the Work.

2. Unless otherwise agreed to in the preconstruction conference, allow at least 14 working days in the construction schedule for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

D. The Architect will review the submittals on shop drawings, product data and samples and one (1) resubmittal.

1. For submittals in excess of the one (1) resubmittal, the Contractor shall reimburse the Owner, for additional services required of the Architect, and the Architect’s consultant by these additional resubmittals.

2. No time will be allowed the Contractor for delays caused by excess number of resubmittals.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

G. 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.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

1. Include Contractor’s certification stating that information submitted complies with requirements of the Contract Documents.

I. 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.

J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

K. All submittals to be received within 120 days of Official Notice to Proceed.
   1. Failure to have all submittals within the required time frame could result in a reduced or rejected payment application

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

   1. Contractor’s acceptance of Electronic Data in any form shall constitute acceptance of Terms and Conditions of this Section, including payment of indicated fees.

   2. Electronic Data includes but is not limited to, computer-aided design (CAD) files including native file formats (DWG) and drawing exchange formats (DXF), and files produced by word processing, spread sheet, scheduling, data base and other software programs. The Electronic Data may be provided in an original format produced by Architect or an alternate, “translated” format as requested by other parties to this Agreement.

   3. The means by which the Electronic Data is transferred may include but are not limited to, electronic mail, File Transfer Protocol (FTP) sites, project websites, and disk copies transmitted between the parties to this Agreement. Contractor acknowledges that Electronic Data transferred in any manner or translated from the system and format used by Architect to an alternate system or format is subject to errors that may affect the accuracy and reliability of the data and that the data may be altered, whether inadvertently or otherwise. Accordingly, Architect makes no warranty, express or implied, as to the accuracy of the information transferred. The Electronic Data are not the Construction Documents and differences may exist between these electronic files and corresponding hard-copy Construction Documents. Architect reserves the right to retain hard copy originals in addition to electronic copies of the Electronic Data transferred, which originals shall be referred to and shall govern.

   4. The Electronic Data provided by Architect under the terms of this Agreement are the proprietary information of Architect. All Electronic Data shall be treated as confidential and shall not be disclosed to or shared with others without Architect’s express, written consent.

   5. The files provided by the Architect are a product of the production of the drawings used to construct the building. The Architect does not warrant the accuracy of the drawings. The recipient of the CAD files acknowledges that drawings may not be accurate that all dimensions or relationships between materials shall be field verified.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Digital Submittals: Submit PDF file of each submittal, unless otherwise indicated. PDF shall include a letter of transmittal and contractor's stamp denoting review and approval. List all components included in the submittal and list items required, but excluded from current submittal to be provided separately.
2. Number of Copies: For non-electronic submittals, submit three copies of each submittal, unless otherwise indicated. Architect will return three copies. Mark up and retain one returned copy as a Project Record Document.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Manufacturer's catalog cuts.
   e. Wiring diagrams showing factory-installed wiring.
   f. Printed performance curves.
   g. Operational range diagrams.
   h. Compliance with recognized trade association standards.
   i. Compliance with recognized testing agency standards.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.

D. Samples: Prepare physical units of materials or products, including the following:

1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
2. 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.
3. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

E. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

F. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

G. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit one copies of each submittal, unless otherwise indicated. Architect will not return copies.

2. Certificates and Certifications: Provide a notarized 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.

3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."

B. Testing and Inspection Reports: Comply with requirements in Division 1 Section “Quality Requirements.”

C. Coordination Drawings: Comply with requirements specified in Division 1 Section "Project Management and Coordination."

D. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

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, names and addresses of architects and owners, and other information specified.

F. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

G. Installer Certificates: Prepare 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.

H. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

I. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

J. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

K. Material Test Reports: Prepare 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.

L. Product Test Reports: Prepare written reports indicating 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.

M. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

N. Preconstruction Test Reports: Prepare 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.

O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."

R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equip. Include name of product and name, address, and telephone number of manufacturer.

T. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents including specific specification sections, 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 Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of 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.

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.

2.4 ATTIC STOCK

A. Attic Stock is to be inventoried and put on a spread sheet provided to the owner and left at the site in a location or locations designated by the owner. Locate attic stock material in a storage room as directed by the owner.

1. One unopened, properly labeled, one gallon of paint for each color and type used on the project.
2. Ceiling tile: 2%, but not less than one unopened box, of each ceiling tile used on the project.
3. Resilient Base and Accessories: 1%, but not less than one unopened box, of each type, color, pattern, and size of resilient product installed.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. 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.

D. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01 33 00

SECTION 01 35 16 - ALTERATION PROJECT PROCEDURES

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 special procedures for alteration work.

1.3 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 pre-bid 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 existing items that are not to be removed or dismantled.

L. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 PROJECT MEETINGS FOR ALTERATION WORK

A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.

1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, specialists, and chemical-cleaner manufacturer(s) shall be represented at the meeting.
2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
    a. Alteration Work Sub-schedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Fire-prevention plan.
    c. Governing regulations.
    d. Areas where existing construction is to remain and the required protection.
    e. Hauling routes.
    f. Sequence of alteration work operations.
    g. Storage, protection, and accounting for salvaged and specially fabricated items.
    h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
    i. Qualifications of personnel assigned to alteration work and assigned duties.
    j. Requirements for extent and quality of work, tolerances, and required clearances.
    k. Embedded work such as flashings and lintels, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.

B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. 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, Architect and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
    a. Alteration Work Sub-schedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
    b. Schedule Updating: Revise Contractor's Alteration Work Sub-schedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
        1) Interface requirements of alteration work with other Project Work.
        2) Status of submittals for alteration work.
        3) Access to alteration work locations.

4) Effectiveness of fire-prevention plan.
5) Quality and work standards of alteration work.
6) Change Orders for alteration work.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.5 SALVAGED MATERIALS

A. Review all salvageable materials with the owner prior to removal from the site. The owner reserves the right to keep any and all materials noted to be demolished whether intended for reinstallation in the project or intended to be discarded. Inventory all materials and include an assessment of condition for review by the owner prior to removal from the site.

1. Carefully demount and salvage each item or object where indicated in a manner to prevent damage and protect it from damage, then promptly store where directed at Project site.

1.6 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. 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.

B. 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.

C. 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 or more above the dew point.

D. Storage Space:

1. Arrange for off-site locations for storage and protection of salvaged material that cannot be stored and protected on-site.

1.7 FIELD CONDITIONS

A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of preconstruction photographs.

B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.

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 students, staff, and 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 at points of student entry from car and bus drop-off and maintain 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 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.

F. Mechanical Insulation over Existing Roofing: Prior to the start of work in an area, install roofing protection.

1. Prepare roofing for removal and new roofing where indicated for new mechanical work at the appropriate time so as to not expose the building interior to prolonged exposure to the elements.

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, 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.
    e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.

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. Have specialty work performed only by qualified specialists.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Record existing work before each procedure (pre-construction), and record progress during the work. Use digital preconstruction documentation photographs.

D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.

E. 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 01 35 16

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control, including special inspections and structural testing performed during the progress of the Work.

1. A Certificate of Occupancy cannot be issued without documentation that these inspections have been performed and the Work is in conformance with the Contract Documents.

2. Refer to the Schedule of Required Special Inspections at the following of this Section.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. See Divisions 2 through 15 Sections, and drawings, for specific test and inspection requirements.

1.2 DEFINITIONS

A. 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.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. 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, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1. Conflicting requirements or information in the documents shall be submitted to the Architect as an RFI for review and response.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 SUBMITTALS

A. Qualification Data: 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.

B. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.

8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. 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.

D. 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.

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 are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.6 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 inspecting they are engaged to perform.

2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be borne by the Contractor. Retesting and reinspection fees will be withheld from the contractor’s pay app. It is not to be performed through a change order. No money shall flow from the contractor to the testing/inspection firm.

B. Tests and inspections:

1. Tests and inspections required by the Contract Documents or authorities having jurisdiction shall be provided by the Contractor but paid for by the Owner. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required by authorities having jurisdiction, whether specified or not.

2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least two (2) business days in advance of time when Work that requires testing or inspecting will be performed.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor for convenience or additional verification shall be at Contractor’s expense.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

7. Owner shall be given the opportunity to witness all testing.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."

D. 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.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, 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.

B. Schedule of Special Inspections: Refer to **Section 014150** for complete list of required structural special inspections.

1. Comply with **Seismic Design Category “C”**

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. 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 modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

COVER PAGE - SECTION 01 41 50 - SPECIAL INSPECTIONS AND TESTING

This section include:

- SE-962 Statement of Special Inspections Responsibilities
- Statement of Special Inspections by Structural Engineer

SE-962
STATEMENT OF SPECIAL INSPECTIONS RESPONSIBILITIES
(For Chapter 17 Inspections Only)

AGENCY: Midlands Technical College

PROJECT NAME: AMSC Expansion - Airport

PROJECT NUMBER: H59-N301-SB

INSPECTION FIRM: _____

ADDRESS: **Street/PO Box**: _____

City: _____ **State:** _____ **ZIP:** _____ - _____

CONTACT PERSON: _____

EMAIL: _____ **TELEPHONE:** _____

ARCHITECT-ENGINEER (A/E): Goodwyn Mills Cawood, LLC (GMC)

CONTRACTOR: _____

A. AGENCY

In accordance to Section 1704 of the 2021 International Building Code (IBC), an independent testing/inspection firm is to perform required special inspections. The above-named Inspection Firm has been retained to perform the duties of special inspection.

B. A/E RESPONSIBILITY

1. The registered design professional in responsible charge has included special inspection requirements and specifications on the plans and prepared the Statement of Special Inspections in accordance with IBC section 1704.3.
2. The registered design professional in responsible charge shall review the special inspection reports and provide corrective action for work that may not conform to the approved plans.

C. CONTRACTOR'S RESPONSIBILITIES

1. **Assuring Subcontractor Compliance**
   - **a.** The Contractor is responsible to advise his subcontractors of the inspection and testing requirements affecting their work and assuring conformance with all notice requirements necessary to assure timely performance of required inspections and tests.
   - **b.** The Contractor shall maintain on the job site, a copy of the Statement of Special Inspections signed by each subcontractor and/or supplier whose work requires inspection and/or testing pursuant to said Statement. Such signature shall constitute acknowledgement that they have read and agree to the inspection and testing requirements of the Statement of Special Inspections.
2. **Notify the Inspection Firm**
   The Contractor is responsible for notifying the inspection firm at least two business days before the required inspections.
3. **Written Statement of Responsibility**
   Contractor shall complete this form to satisfy IBC 1704.4, Contractor responsibility for construction of designated main-wind or seismic force resisting system.
4. **Provide Access to Office of State Engineer Approved Plans**
   The approved plans shall be readily accessible at the job site.

5. **Provide Access to Work**
   The Contractor shall provide reasonable access to all work requiring special inspection.

6. **Retaining Special Inspection Reports at the Job Site**
   The Contractor is also responsible for retaining at the job site all special inspection records submitted by the special inspector, and providing these records for review by the Agency, Architect-Engineer, and/or OSE upon request.

7. **Notify Agency of Special Inspections** prior to scheduled inspection time.

D. SPECIAL INSPECTOR RESPONSIBILITIES

1. **Responding to Request for Inspection(s)**
   - **a.** The inspection firm shall respond to a request to schedule an inspection/test and schedule the inspection(s)/test(s) no later than two (2) business days after receiving the request.
   - **b.** The inspection firm shall immediately notify the building official and Agency by email if the construction Contractor is failing to request required inspections

2. **Observe the work**
   - **a.** The inspector(s) shall observe the work for compliance with the OSE approved plans, specifications, and applicable provisions of the IBC. The A/E's reviewed shop drawings, and/or placement drawings, may be used only as an aid to inspections.
   - **b.** The inspection firm shall maintain the Project Inspection/Material Testing Log (SE-965), at the jobsite
   - **c.** For each inspection trip, the inspection firm's inspectors and testing technicians shall document on the SE-965 the following information before leaving the site:
     - **1)** the date of the inspection(s),
     - **2)** the time they arrived,
     - **3)** their name and ICC certification number,
     - **4)** the type and location of inspection(s) and/or test(s) to be performed,
     - **5)** that they gave a written report to the construction contractor prior to leaving the site, and
     - **6)** the time they left the site.

3. **Report non-conforming items**
   - **a.** The inspector shall bring non-conforming items to the immediate attention of the General Contractor while on site.
   - **b.** The inspector shall notify the Agency and A/E within 24 hours of any re-inspection requirements, and shall document the date of the deficiency, the name of the inspector that discovered the deficiency and any action taken to correct each deficiency on the Project Inspection/Material Testing Deficiency Log (SE-966), at the jobsite.
   - **c.** The inspection firm shall forward a copy of the SE-965 and SE-966 to OSE monthly.

4. **Furnish reports**
   - **a.** For each inspection trip, the inspector shall make a written report and provide a copy of the report to the construction contractor's project superintendent before to leaving the site. The copy provided to the construction contractor shall not be via a link to a website unless the Contractor agrees to such delivery in writing.
   - **b.** The inspection firm shall provide the OSE, Agency and A/E a copy of the report within two business days after the inspection. The means of delivery of the report to the Agency and A/E is subject to the approval of the Agency. OSE will accept delivery via an attachment to email. OSE will not accept delivery via a link to a website.
   - **c.** Each written report shall include the results of the inspection, a summary of any communication with the construction Contractor, and supporting photographs

5. **Stop Work**
   The inspector does not have the authority to issue a Stop Work Order unless a hazardous situation presents an immediate threat to the health, safety, or welfare of people on or about the project site.

E. OFFICE OF STATE ENGINEER (OSE)

1. **Review special inspections**
   OSE will review project inspection reports and all Project Inspection/Material Testing Logs and Deficiency Logs.
2. **Issue Certificate of Occupancy**
   OSE will only issue a Certificate of Occupancy after all special inspection reports have been submitted and all deficiencies have been resolved.

ACKNOWLEDGMENTS

The undersigned read and understand our responsibilities regarding special inspections.

AGENCY: _____ **DATE:** _____
(Signature of Representative)

PRINT NAME: _____

CONTRACTOR: _____ **DATE:** _____
(Signature of Representative)

PRINT NAME: _____

INSPECTION FIRM: _____ **DATE:** _____
(Signature of Representative)

PRINT NAME: _____

A/E: _____ **DATE:** _____
(Signature of Representative)

PRINT NAME: Justin Lucas, AIA, NCARB

Statement of Special Inspections

Project: Midlands Technical College – AMSC Center Addition Permit Number: _____

Project Location: 1260 Lexington Dr.

Owner/Address: Midlands Technical College City West Columbia Zip 29170

Registered Design Professional
In Responsible Charge of
Construction Documents: William J. Hannah, PE

Address: 25 Woods Lake Rd., Suite 210

City: Greenville State: SC Zip: 29607 Phone: 803-999-1482

E-mail: billh@adcengineering.com

This statement of Special Inspections attached is submitted as a condition for permit issuance in accordance with Section 1704 of the 2021 International Building Code. It includes a Schedule of Special Inspection Services applicable to the above referenced project as well as the identity of the individuals, agencies, or firms (completed by others) intended to be retained for conducting these inspections. The Special Inspection Coordinator (Registered Design Professional In Responsible Charge of Administering Special Inspections) shall keep records of all inspections and shall furnish interim inspection reports to the Engineer of Record (Registered Design Professional in Responsible Charge of Construction Documents) at a frequency agreed upon by the permit applicant and Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor and the Engineer of Record for correction. If the discrepancies are not corrected, the Special Inspection Coordinator shall bring the discrepancies to the attention of the Building Official and the Engineer of Record prior to the completion of that phase of work. The Special Inspection Coordinator shall submit a Final Report of Special Inspections to the building official at the conclusion of the project and before a certificate of occupancy will be issued.

This Statement of Special Inspections encompasses the following disciplines:

☒ Structural ☐ Mechanical/Electrical/Plumbing
☐ Architectural ☐ Other: _____

Prepared by:

William J. Hannah
Type or Print Name

Signature

December 15, 2025
Date



Preparer's Seal and Signature Required

To be filled out by the jurisdiction and returned to applicant
Building Official's Acceptance of Special Inspections ☐ ☐

Frequency of Interim reports: Monthly Bi-Monthly ☐ Upon Completion ☐ Per Attached Schedule

Signature Date TMS Permit Number

Schedule of Inspection and Testing Agencies

This Statement of Special Inspections includes the following building systems:

- ☒ Soils and Foundations
- ☒ Cast-in-Place Concrete
- ☐ Precast Concrete
- ☐ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Wood Construction
- ☐ Architectural Components
- ☐ Mechanical & Electrical Systems
- ☐ Storage Racks
- ☐ Spray Fire Resistant Material
- ☐ Special Cases

Special Inspection Agencies	**Firm**	**Address, Telephone, e-mail**
1. **Special Inspection Coordinator (Registered Professional in Responsible Charge of Administering Special Inspections)**		
2. Inspector		
3. Inspector		
4. Testing Agency		
5. Testing Agency		
6. Other		

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Agent, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Qualifications of Inspectors and Testing Technicians

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official and shall be in accordance with the building code or any particular requirements of the specifications or material specific referenced standards. The credentials of all Inspectors and testing technicians shall be provided if requested.

Special Inspection Definitions

Continuous Special Inspection - Special inspection by the special inspector who is present when and where the work to be inspected is being performed.

Periodic Special Inspection - Special inspection by the special inspector who is intermittently present where the work to be inspected has been or is being performed. Unless noted otherwise 100% of the work designated for inspection shall be inspected.

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1704.2.5 Special Inspection of Fabricated Items	
Structural Steel Fabrication: Verify Fabrication/Quality Control Procedures	Verify Steel Fabrication plant is AISC certified

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.1.1 Special Cases	
Post Installed Anchors	
Installer Qualifications	**Review** installer training records to confirm they have received manufacturer training per the contract documents
Anchor Installation	**Continuously** inspect complete process of anchor installation in accordance with requirements of approved ICC ESR report. As minimum review installation procedures including drill bit type, drilling methods, hole preparation and cleaning, spacing, edge distance, embedment depth, adhesive installation, rod installation, curing time, and anchor torque to ensure compliance with manufacturer's instructions and construction documents. (**All anchor holes must be inspected during drilling, all anchor holes must be inspected prior to anchor installation, all anchors shall be inspected at final application of required torque)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel	
Review fabricator's source quality assurance inspection and testing report submittals	**Periodically** review fabricator's source quality assurance inspection and test reports to ensure all inspection and testing is being completed as required and appropriate standards are being met. **(100% rate for all source quality control report submittals.)**
Conduct Inspections prior to field welding in accordance with AISC 360 Table N5.4-1	**Periodically** confirm welder qualification records and continuity records are current **Periodically** confirm that welding procedure specifications (WPS) are available and on site for type and configuration of weld being completed. **(100% rate for each type and configuration of weld immediately prior to the weld being completed)** **Periodically** confirm manufacturers certifications are available and on site for all welding consumables. **(100% rate for each type of consumable immediately prior to initial use of each consumable)** **Periodically** inspect material identification (type/grade) **Periodically** confirm that a welder identification system is in place for field welding and that the system is being used **(confirm system is in place prior to welding and 100% confirmation of system usage during welding inspection)** **Periodically** inspect fit-up of groove welds including joint preparation, dimensions, cleanliness, tacking, backing type and backing fit **(100% inspection rate of all groove weld joints immediately prior to completing weld)** **Periodically** inspect fit-up of groove welds of HSS T-, Y-, and K- joints without backing (including joint geometry) for: joint preparation, dimensions, cleanliness, and tacking. **(100% inspection rate of all groove weld joints immediately prior to completing weld)** **Periodically** inspect configuration and finish of weld access holes **(100% inspection rate of all weld access holes immediately prior to completing associated weld)** **Periodically** inspect fit-up of fillet welds including dimensions, cleanliness, and tacking **(Random inspection rate for general conformance with a minimum rate of once weekly during steel erection)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct inspections during field welding in accordance with AISC 360-10 Table N5.4-2	**Periodically** confirm that welders are qualified for welds which they are completing and they possess a valid welding certificate for that weld type and configuration **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically** inspect control and handling of welding consumables including packaging and exposure control. **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically** confirm that no welding is occurring over cracked tack welds. **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically** confirm that environmental conditions are acceptable including wind speed limits, precipitation and temperature. **(Random inspection rate for general conformance with a minimum rate of once weekly during welding operations)** **Periodically/Continuously** confirm that weld procedure specifications (WPS's) are being followed including settlings of welding equipment, travel speed, selected welding materials, shielding gas type and flow rate, preheat applied, interpass temperature maintained, and proper position. **(Continuously inspect for groove welds, multi-pass welds, or welds greater than 5/16". Periodically inspect all other welds a minimum rate of once weekly during welding operations)** **Periodically/Continuously** confirm welding techniques including interpass and final cleaning, each pass with profile limitations, each pass meets quality requirements. **(Continuously inspect for groove welds, multi-pass welds, or welds greater than 5/16". Periodically inspect all other welds a minimum rate of once weekly during welding operations)** **Periodically** inspect placement and installation of steel headed stud anchors. **(Random inspection rate for general conformance with a minimum rate of once daily during welding operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct inspections after field welding in accordance with AISC 360-10 Table N5.4-3	**Periodically** confirm that welds have been cleaned. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** confirm weld size, length and location. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** confirm weld meets visual acceptance criteria including crack prohibition, weld/base-metal fusion, crater cross section, weld profiles, weld size, undercut, and porosity. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect arc strikes. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect k-area for cracks within 3" of welds when welding has been performed in k-area. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect weld access holes in rolled heavy shapes and built-up heavy shapes and inspect those weld access holes for cracks. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** confirm backing and weld tabs have been removed where required. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect repair activities. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** document acceptance or rejection of welded joint or member. **(100% inspection rate with a minimum rate of once weekly during welding operations)** **Periodically** inspect no prohibited welds have been added without the approval of the EOR. **(100% inspection rate with a minimum rate of once weekly during welding operations)**
Nondestructive testing of field welded joints	**Periodically** ultrasonically test all complete joint penetration welds (CJP) in accordance with AWS D1.1 **(100% inspection rate)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct Inspections prior to high strength bolting in accordance with AISC 360-10 Table N5.6-1	**Periodically** confirm manufacturers certifications are available each type of fastener material. **(100% rate for each type of fastener material immediately prior to initial use of each type of material)** **Periodically** confirm fasteners are marked in accordance with ASTM Standard. **(Random inspection rate for general conformance with a minimum rate of once weekly during bolting operations)** **Periodically** confirm correct fasteners are selected for the joint detail including grade, type, and bolt length (if threads are to be excluded from shear plane). **(100% inspection rate)** **Periodically/Continuously** confirm correct bolting procedure selected for joint detail. **(100% inspection rate, continuous inspection for slip critical joints, periodic inspection for all other joints with random inspection with a minimum rate of once weekly during bolting operations)** **Periodically/Continuously** inspect connection elements, including appropriate faying surface condition and hole preparation meet applicable requirements. **(continuous inspection for slip critical joints with 100% inspection rate, periodic inspection for all other joints with random inspection with a minimum rate of once weekly during bolting operations)** **Periodically/Continuously** Conduct Preinstallation verification testing by installation personnel and document for fastener assemblies and methods used for slip critical joints. **(Periodically, one time per installer for turn of nut, direct tension indicators, or tension controlled bolts. Periodically, once daily for calibrated wrench without match marking)** **Periodically** confirm protected storage provided for bolts, nuts, washers and other fastener components. **(Random inspection rate for general conformance with a minimum rate of once weekly during bolting operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.2.1 Structural Steel (Continued)	
Conduct Inspections during high strength bolting in accordance with AISC 360-10 Table N5.6-2	**Periodically/Continuously** confirm fastener assemblies placed in all holes and washers are positioned as required. **(100% inspection rate, continuous inspection for slip critical joints, periodic inspection for all other joints with random inspection with a minimum rate of once weekly during bolting operations)** **Continuously** confirm joints are brought to the snug-tight condition prior to pretensioning operation **(100% inspection rate, continuous inspection for slip critical joints)** **Continuously** component not turned by the wrench is prevented from rotating **(100% inspection rate, continuous inspection for slip critical joints)** **Periodically/Continuously** confirm fasteners are pretensioned in accordance with the RCSC Specification, progressing systematically from the most rigid point toward the free edges **(100% inspection rate, continuous inspection for slip critical joints pretensioned with calibrated wrench or turn-of-the-nut without match marking. Periodic inspection for slip critical joints pretensioned with tension controlled bolts, direct tension indicators, or turn-of-the-nut with match marking**
Conduct Inspections after high strength bolting in accordance with AISC 360-10 Table N5.6-3	**Periodically** document acceptance or rejection of bolted connections. **(100% rate with a minimum rate of once weekly during welding operations)**
Other inspection Task	**Periodically** inspect placement of anchor rods and other embedded items prior to concrete/masonry grout placement operations. Confirm diameter, grade, type and length of the anchor rod or embedded item, and the extent or depth of embedment into concrete/masonry grout. **(100% inspection rate immediately prior to concrete/masonry grout placement operation)** **Periodically** inspect the steel frame to verify compliance with the details shown on the construction documents including braces, stiffeners, member locations, and proper application of joint details at each connection. **(100% inspection rate with a minimum rate of once weekly during steel erection operations)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.3 Concrete Construction	
Inspection of reinforcing steel, and placement	**Periodically** inspect reinforcing steel placement in accordance with contract documents and approved shop drawings to confirm size, spacing, cover, positioning, bends, grade, laps, supports and anchorage. **(100% inspection rate immediately prior to placing concrete)**
Reinforcing bar welding	**Periodically** verify weldability of reinforcing bars other than ASTM A706. **(100% inspection rate immediately prior to placing concrete)** **Periodically** inspect single-pass fillet welds, maximum 5/16" (AWS D1.4, ACI 318: 26.6.4 **(100% inspection rate immediately prior to placing concrete)** **Continuously** inspect all other welds. **(100% inspection rate during concrete placement)**
Inspection of anchors cast in concrete	**Periodically** inspect size, positioning, embedment, and projection of anchor rods is in accordance with contract documents and approved shop drawings. **(100% inspection rate immediately prior to placing concrete)** **Continuously** inspect concrete placement and consolidation around anchors. **(100% inspection rate during concrete placement)**
Inspection of anchors post-installed in hardened concrete members.	**Review** installer training records to confirm they have received manufacturer training per the contract documents **Continuously** inspect complete process of anchor installation in accordance with requirements of approved ICC ESR report. As minimum review installation procedures including drill bit type, drilling methods, hole preparation and cleaning, spacing, edge distance, embedment depth, adhesive installation, rod installation, curing time, and anchor torque to ensure compliance with manufacturer's instructions and construction documents. (**All anchor holes must be inspected during drilling, all anchor holes must be inspected prior to anchor installation, all anchors shall be inspected at final application of required torque)**
Verifying use of required design mix	**Periodically** review batch tickets to confirm the appropriate approved mix design is being used for the location in which concrete is being placed **(100% review rate during concrete placement)** **Periodically** verify that water added at the site does not exceed that allowed by the batch ticket **(100% inspection rate during concrete placement)**

1705.3 Concrete Construction (Continued)	
Sample fresh concrete to fabricate specimens for strength tests, perform fresh unit weight density, slump and air content tests, and determine the temperature of concrete	**Continuously** test concrete compressive strength (ASTM C31 & C39), fresh unit weight density (ASTM C138), slump (ASTM C143), air-content (ASTM C231 or C173) and temperature (ASTM C1064). Samples for preparing unit weight density specimens and measuring air content shall be obtained at the point of placement. Slump measurements are for reference only and shall not be a basis of rejection. Threshold for fresh unit weight density shall be in accordance with approved mix design submittals (**Frequency of sampling and testing as required by section 21.16 of ACI 318)**
Inspection of concrete for proper application techniques	**Continuously** inspect concrete placement techniques to confirm compliance with section 26.5 of ACI 318.
Inspection for maintenance of specified curing temperatures and techniques	**Periodically** inspection curing temperatures and techniques to insure compliance with contract documents and sections 26.5.3, 26.5.4 and 26.5.5 of ACI 318
Inspection of formwork for shape, location and dimensions of concrete member being formed	**Periodically** inspect formwork to ensure compliance with dimensions of members indicated on contract documents **(100% inspection rate during concrete placement)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.6 Soils	
Verify materials below shallow foundations are adequate to achieve the design bearing capacity	**Periodically** inspect soils within building footprint for adequate bearing capacity and consistency with the geotechnical report**.** **(100% inspection rate)**
Verify excavations are extended to proper depth and have reached proper material	**Periodically** inspect all footing excavations to ensure they are to proper depth and have reached proper material as indicated on contract documents and/or geotechnical report. **(100% inspection rate immediately prior to placement to reinforcing steel for foundations)** **Periodically** inspect all unsuitable material excavations to ensure they are to proper depth and have reached proper material as indicated on contract documents and/or geotechnical report. **(100% inspection rate of all areas of unsuitable fill removal immediately prior to placement of fill)**
Perform classification testing of compacted fill materials.	**Periodically** perform testing of fill materials to ensure compliance with contract documents and geotechnical report. Classification and testing shall be in accordance with the Geotechnical report. Where the geotechnical report does not specifically indicate testing, the minimum testing shall be sieve tests (ASTM D422 & D1140) and Standard Proctor tests (ASTM D98). **(Testing shall be completed for each source of material, or where obvious changes of properties of fill materials are realized)**
Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill	**Continuously** verify materials for compacted fill to ensure materials have been previously tested and are in compliance with the contract documents and geotechnical report. **(100% inspection rate)** **Periodically** test density of each lift of fill within the building footprint to confirm compliance with compaction requirements outlined in the contract documents and geotechnical report. **(Where inspection rates are not indicated in the geotechnical report, not less than one test per each lift per 2000 sq ft of fill placed)** **Continuously** verify lift thicknesses are during placement of compacted fill to ensure lift thickness is in compliance with the contract documents and geotechnical report. **(100% inspection rate)**
Prior to placement of compacted fill, inspect subgrade and verify that the site has been prepared properly.	**Periodically** inspect subgrade within the building footprint prior to placement of compacted fill to ensure subgrade complies with contract documents and geotechnical report. **(100% inspection rate of all areas immediately prior to placement of fill)**

MATERIAL / ACTIVITY	SCOPE OF SERVICE
1705.11 Special Inspections for Wind Resistance	
1705.11.3 Wind Resisting Components	**Periodically** inspect the installation of Roof Cladding is in accordance with approved submittals and manufacturer's installation requirements **(Random inspection rate for general conformance with a minimum rate of once weekly during roof cladding installation)** **Periodically** inspect the installation of Wall Cladding is in accordance with approved submittals and manufacturer's installation requirements **(Random inspection rate for general conformance with a minimum rate of once weekly during wall cladding installation)**

END OF SECTION

SECTION 01 42 00 - REFERENCES

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 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.

1.3 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.

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.

1.4 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. This information 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.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.
15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; 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.
29. ASCE - American Society of Civil Engineers; 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.

32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; (See ECIA).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
73. ECIA - Electronic Components Industry Association; www.eciaonline.org.
74. EIA - Electronic Industries Alliance; (See TIA).
75. EIMA - EIFS Industry Members Association; www.eima.com.
76. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
77. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
78. ESTA - Entertainment Services and Technology Association; (See PLASA).
79. EVO - Efficiency Valuation Organization; www.evo-world.org.
80. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.

81. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
82. FM Approvals - FM Approvals LLC; www.fmglobal.com.
83. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
84. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
85. FSA - Fluid Sealing Association; www.fluidsealing.com.
86. FSC - Forest Stewardship Council U.S.; www.fscus.org.
87. GA - Gypsum Association; www.gypsum.org.
88. GANA - Glass Association of North America; www.glasswebsite.com.
89. GS - Green Seal; www.greenseal.org.
90. HI - Hydraulic Institute; www.pumps.org.
91. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
92. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
93. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
94. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
95. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
96. IAS - International Accreditation Service; www.iasonline.org.
97. IAS - International Approval Services; (See CSA).
98. ICBO - International Conference of Building Officials; (See ICC).
99. ICC - International Code Council; www.iccsafe.org.
100. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
101. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
102. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
103. IEC - International Electrotechnical Commission; http://www.iec.ch.
104. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
105. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
106. IESNA - Illuminating Engineering Society of North America; (See IES).
107. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
108. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
109. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
110. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
111. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
112. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
113. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
114. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
115. ISO - International Organization for Standardization; www.iso.org.
116. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
117. ITU - International Telecommunication Union; www.itu.int/home.
118. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
119. LMA - Laminating Materials Association; (See CPA).
120. LPI - Lightning Protection Institute; www.lightning.org.
121. MBMA - Metal Building Manufacturers Association; www.mbma.com.
122. MCA - Metal Construction Association; www.metalconstruction.org.
123. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
124. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
125. MHIA - Material Handling Industry of America; www.mhia.org.
126. MIA - Marble Institute of America; www.marble-institute.com.
127. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
128. MPI - Master Painters Institute; www.paintinfo.com.

129. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
130. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
131. NACE - (National Association of Corrosion Engineers International); www.nace.org.
132. NADCA - National Air Duct Cleaners Association; www.nadca.com.
133. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
134. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
135. NBI - New Buildings Institute; www.newbuildings.org.
136. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
137. NCMA - National Concrete Masonry Association; www.ncma.org.
138. NEBB - National Environmental Balancing Bureau; www.nebb.org.
139. NECA - National Electrical Contractors Association; www.necanet.org.
140. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
141. NEMA - National Electrical Manufacturers Association; www.nema.org.
142. NETA - InterNational Electrical Testing Association; www.netaworld.org.
143. NFHS - National Federation of State High School Associations; www.nfhs.org.
144. NFPA - National Fire Protection Association; www.nfpa.org.
145. NFPA - NFPA International; (See NFPA).
146. NFRC - National Fenestration Rating Council; www.nfrc.org.
147. NHLA - National Hardwood Lumber Association; www.nhla.com.
148. NLGA - National Lumber Grades Authority; www.nlga.org.
149. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
150. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
151. NRCA - National Roofing Contractors Association; www.nrca.net.
152. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
153. NSF - NSF International; www.nsf.org.
154. NSPE - National Society of Professional Engineers; www.nspe.org.
155. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
156. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
157. NWFA - National Wood Flooring Association; www.nwfa.org.
158. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
159. PDI - Plumbing & Drainage Institute; www.pdionline.org.
160. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
161. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
162. RFCI - Resilient Floor Covering Institute; www.rfci.com.
163. RIS - Redwood Inspection Service; www.redwoodinspection.com.
164. SAE - SAE International; www.sae.org.
165. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
166. SDI - Steel Deck Institute; www.sdi.org.
167. SDI - Steel Door Institute; www.steeldoor.org.
168. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
169. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
170. SIA - Security Industry Association; www.siaonline.org.
171. SJI - Steel Joist Institute; www.steeljoist.org.
172. SMA - Screen Manufacturers Association; www.smainfo.org.
173. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
174. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
175. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
176. SPIB - Southern Pine Inspection Bureau; www.spib.org.
177. SPRI - Single Ply Roofing Industry; www.spri.org.
178. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.

179. SSINA - Specialty Steel Industry of North America; www.ssina.com.
180. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
181. STI - Steel Tank Institute; www.steeltank.com.
182. SWI - Steel Window Institute; www.steelwindows.com.
183. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
184. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
185. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
186. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
187. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
188. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance
189. TMS - The Masonry Society; www.masonrysociety.org.
190. TPI - Truss Plate Institute; www.tpinst.org.
191. TPI - Turfgrass Producers International; www.turfgrasssod.org.
192. TRI - Tile Roofing Institute; www.tileroofing.org.
193. UL - Underwriters Laboratories Inc.; www.ul.com.
194. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
195. USAV - USA Volleyball; www.usavolleyball.org.
196. USGBC - U.S. Green Building Council; www.usgbc.org.
197. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
198. WASTEC - Waste Equipment Technology Association; www.wastec.org.
199. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
200. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
201. WDMA - Window & Door Manufacturers Association; www.wdma.com.
202. WI - Woodwork Institute; www.wicnet.org.
203. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
204. WWPA - Western Wood Products Association; 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 fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; 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.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.

11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; 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. OSE – Office of State Engineer, SC;

   Office of State Engineer (Construction) | procurement.sc.gov

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. See Division 1 Section "Execution Requirements" for progress cleaning requirements.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. Water Service: Use water from owner’s existing water system without metering and without payment of use charges.

B. Electric Power Service: Use electric power from owner’s existing system without metering and without payment of use charges.

1.4 SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1. Indicate temporary construction fence location, material, and height and location of temporary Job Trailer.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall 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.

1. The contractor is permitted to use the existing services within the existing facility during construction and at no cost to the contractor or project.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.

2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts**,** with 1-5/8-inch- (42-mm-) OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

C. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain-link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.

2.2 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
3. Drinking water and private toilet.
4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Drinking-Water Fixtures: Drinking-water fountains, containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

C. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

D. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

E. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

F. Temporary Job Trailer: Contractor is **NOT** permitted to use the existing building as the temporary job trailer.

G. On-site meetings: Contractor is **permitted** to use the existing building to hold on-site meeting with owner and project teams, such as OAC meeting, etc. Coordinate an appropriate location with **Agency Project Coordinator – Tommy Wise**.

H. Temporary Toilet Fixtures: Contractor is **not** permitted to use sanitary facilities / toilets in existing buildings on site and is required to provide temporary portable toilets and handwashing facilities for the duration of construction. The use of restroom facilities within the building is prohibited. Contractor to coordinate location of portable toilets with owner prior to construction commencing.

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

B. Temporary Job Trailer: Use of a Job Trailer at the commencement of construction is required.

C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained 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, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. 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.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

H. Temporary HVAC Systems: The General Contractor shall be responsible for providing temporary heating in building areas until current Project Schedule indicates the start of the acoustical panel ceilings, carpeting, and other finishes requiring special environmental conditions.

1. Select a safe equipment that will not have a harmful effect on completed installations or elements being installed.
2. The Mechanical, Electrical, Plumbing, and General Contractors must include in their construction schedules provisions for electrical power, natural gas service, water, sewer and storm drainage utilities to be fully functional and available to enable the HVAC systems to be operated as required to facilitate the installation of the Finishes Work.
3. The Mechanical Contractor shall assume responsibility for providing heating and cooling after the current Project Schedule indicates the start of the Finishes Work.
4. The permanent systems in the various building areas shall not be started until doors and exterior windows, or suitable temporary construction is in place and the building is relatively dust free. At a minimum, the floors shall be broom clean, drywall finishing and paint spraying completed.
5. If in the Architect’s sole opinion conditions exist sufficient to compromise the quality of the HVAC system at the date of Owner acceptance, the authorization to startup the permanent system shall be postponed until such time as the unsatisfactory conditions are corrected.
6. The additional cost to maintain the operation of the temporary heating and cooling shall be apportioned by the Architect, to the Contractors whose Work is deficient at the time. Systems shall operate sufficiently to maintain the minimum design temperature and relative humidity within 15 percent.
7. The Warranty on all HVAC equipment will be extended from start-up to one year past the date of Substantial Completion and paid for by the Mechanical Contractor. The Mechanical Contractor, sub-contractors, and manufacturers may in lieu of providing a manufacturer’s extended warranty, provide a service/replacement contract to extend the normal one year warranty period to a minimum of one year beyond the date of acceptance of the building by the Owner. Extended warranties such as five year compressor warranties shall be extended beyond the period established by the actual start-up date of the equipment as defined herein.

I. Electric Power Service: Use of Owner’s existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.

J. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

K. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

L. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.

1. At each telephone, post a list of important telephone numbers.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Contractor's emergency after-hours telephone number.
   e. Architect's office.
   f. Construction Manager's home office.
   g. Engineers' offices.
   h. Owner's office.
   i. Principal subcontractors' field and home offices.

M. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.2 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.

2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.

2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Section 312000 "Earth Moving."

3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Section 321216 "Asphalt Paving."

D. Traffic Control: The Owner will strictly enforce posted speed limits and driving regulations. The Owner reserves the right to take any action deemed appropriate regarding violations including, but not limited to, refusal to permit violators to enter upon or remain on the premises.

1. Escort appropriately to and from the site all large crawler or mobile cranes operating on site and take all precautions necessary to prevent damage to Owner's property during operation both on and off site.

2. Obtain advance written authorization from Owner and local Government Authorities for all road blocks, detours and other interruptions of normal traffic flow that may be needed to facilitate construction operations.

E. Parking:

1. Contractor will be provided access to parking during construction as instructed by the owner.

F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

H. Janitorial Services: Provide janitorial services on a daily basis for temporary offices, first=aid stations, toilets, wash facilities, lunchrooms, and similar areas.

I. 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.

3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Temporary Erosion and Sedimentation Control:

1. Comply with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
2. 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, in accordance with erosion- and sedimentation-control Drawings.

a. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.

b. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
c. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
d. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

B. 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.

C. Tree and Plant Protection:

1. 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.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

E. Construction Site Security: Provide maintenance and cleaning of the entire construction site on a daily basis. Secure all construction equipment, machinery and vehicles, park and store only within fenced area, and render inoperable during non-work hours. Contractor is responsible to ensure that no construction materials, tools, equipment, machinery or vehicles can be sued for unauthorized entry or other damage or interference to activities and security of existing facilities adjacent to and in the vicinity of construction site.

F. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed provide lighting, including flashing red or amber lights.

G. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

3.4 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. Protect from damage caused by freezing temperatures and similar elements.

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: Except for using permanent fire protections as soon as available, 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.

END OF SECTION 10 50 00

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project:

1. Product delivery, storage, and handling.
2. Manufacturers' standard warranties on products.
3. Special warranties.
4. Product substitutions.
5. Comparable products.

B. See Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.

1.2 DEFINITIONS

A. Products: Items purchased 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. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

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

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

B. Product substitutions will only be considered if requested in writing 10 days prior to the date for receipt of bids.

1. Substitution Request Form: Use CSI Form 13.1A.

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
   a. Statement indicating why specified material or product cannot be provided.
   b. Coordination information, including a list of changes or modifications 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 substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
   d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
   e. Samples, where applicable or requested.
   f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
   g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
   h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
   i. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
   j. Cost information, including a proposal of change, if any, in the Contract Sum.
   k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
   l. 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 approved, Architect will issue an addendum to the bidding documents.
   a. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

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 ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.

6. Comply with product manufacturer’s written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

7. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and any products or equipment provided by Owner. Coordinate storage location with Owner.

1.6 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: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specification paragraphs or subparagraphs titled “Product” name a single product and manufacturer, provide the product named.
2. Products: Where Specification paragraphs or subparagraphs titled “Products” introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
3. Manufacturers: Where Specification paragraphs or subparagraphs titled “Manufacturers” introduce a list of manufacturers’ names, provide a product by one of the manufacturers listed that complies with requirements.
4. Available Products: Where Specification paragraphs or subparagraphs titled “Available Products” introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product. Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
5. Available Manufacturers: Where Specification paragraphs or subparagraphs titled “Available Manufacturers” introduce a list of manufacturers’ names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product.
6. Product Options: Where Specification paragraphs titled “Product Options” indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer. Comply with provisions in “Product Substitutions” Article.

7. Basis-of-Design Product: Where Specification paragraphs or subparagraphs titled “Basis-of-Design Product” are included and also introduce or refer to a list of manufacturers’ names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in “Comparable Products” Article to obtain approval for use of an unnamed product or manufacturer.

8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
    a. If no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents on “substitutions” for selection of a matching product.

9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. **Detailed line-by-line comparison** of the significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 70 00 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. General installation of products.
2. Progress cleaning.
3. Starting and adjusting.
4. Protection of installed construction.
5. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. 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.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. 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. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

B. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

C. 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.

D. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

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.

F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

G. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

A. General: Clean Project work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. 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.

C. 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.

D. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

E. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

F. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

G. 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.

H. 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.

I. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6 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. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

SECTION 01 73 10 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

1.3 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. 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.

C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. 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.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

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. 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 as small as possible, neatly to 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. 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.
5. Proceed with patching after construction operations requiring cutting are complete.

C. 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 possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 10

SECTION 01 73 20 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

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

B. See Division 21 Sections for demolishing, cutting, patching, or relocating fire protection items.

C. See Division 22 Sections for demolishing, cutting, patching, or relocating plumbing items.

D. See Division 23 Sections for demolishing, cutting, patching, or relocating mechanical items.

E. See Division 26 Sections for demolishing, cutting, patching, or relocating electrical items.

1.2 DEFINITIONS

A. Remove / Demolish: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain / Existing to Retain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

A. Except for items or materials indicted to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner’s property, demolished materials shall become Contractor’s property and shall be removed from Project site.

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of stairs, and locations of temporary partitions and means of egress.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

1.5 QUALITY ASSURANCE

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 A10.6 and NFPA 241.

C. Pre-demolition Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 7 days notice to Owner of activities that will affect Owner’s operations. Owner permission is also necessary prior to performing any utility disruptions.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

E. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey 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 demolition operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

1. Provide at least 7 days prior notice to Owner if shutdown of service is required for any utility interruption.

C. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.

2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

D. Utility Requirements: Refer to Division 15 and 16 Sections for shutting off, disconnecting, removing, and sealing or capping utilities. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 1 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

3.4 SELECTIVE DEMOLITION

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.

1. 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.

2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. 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 fire watch and portable fire-suppression devices during flame-cutting operations.

4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

6. Dispose of demolished items and materials promptly.

B. Existing Facilities: Comply with District requirements for using and protecting walkways, loading docks, building entries, and other building facilities during selective demolition operations.

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 on-site.
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. Paint equipment to match new equipment.
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.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 01 73 20

SECTION 017419 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

CFR 273	Standards for Universal Waste Management
CFR 173	Shippers - General Requirements for Shipments and Packagings
CFR 178	Specifications for Packagings

1.2 DEFINITIONS

A. Co-mingle: The practice of placing unrelated materials together in a single container, usually for benefits of convenience and speed.

B. Construction Waste: Waste generated by construction activities, such as scrap materials, damaged or spoiled materials, temporary and expendable construction materials, and other waste generated by the workforce during construction activities.

C. Demolition Debris/Waste: Waste generated from demolition activities, including minor-incidental demolition waste materials generated as a result of intentional dismantling of all or portions of a building, to include clearing of building contents that have been destroyed or damaged.

D. Disposal: Depositing waste in a solid waste disposal facility, usually a managed landfill or incinerator, regulated in the US under the Resource Conservation and Recovery Act (RCRA).

E. Diversion: The practice of diverting waste from disposal in a landfill or incinerator, by means of eliminating or minimizing waste, or reuse of materials.

F. Final Construction Waste Diversion Report: A written assertion by a material recovery facility operator identifying constituent materials diverted from disposal, usually including summary tabulations of materials, weigh in short-ton.

G. Recycling: The series of activities, including collections, separation, and processing, by which products or other materials are diverted from the solid waste stream for use in the form of raw materials in the manufacture of new products sold or distributed in commerce, or the reuse of such materials as substitutes for goods made of virgin materials, other than fuel.

H. Reuse: The use of a product or materials again for the same purpose, units original form or with little enhancement or change.

I. Salvage: Usable, salable items derived from buildings undergoing demolition or deconstruction, parts from vehicles, machinery, other equipment, or other components.

J. Source Separation: The practice of administering and implementing a management strategy to identify and segregate unrelated waste at the first opportunity.

1.3 CONSTRUCTION WASTE (INCLUDES DEMOLITION/WASTE)

A. Divert a minimum of 60% by weight of the project construction waste and demolition debris/waste from the landfill or incinerator. Follow industry standards in the management of waste. Apply sound environmental principles in the management of waste.

1. Practice efficient waste management when sizing, cutting, and installing products and materials.

2. Use all reasonable means to divert construction waste and demolition debris/waste from landfills and incinerators and to facilitate the recycling or reuse of excess construction materials.

1.4 CONSTRUCTION WASTE MANAGEMENT

A. Implement a Construction Waste Management Program for the project. Take a pro-active, responsible role in the management of construction waste, recycling process, disposal of demolition debris/waste, and require all subcontractors, vendors, and suppliers to participate in the Construction Waste Management Program. Establish a process for clear tracking and documentation of construction waste and demolition debris/waste.

1. Implementation of Construction Waste Management Program
   a. Develop and document how the Construction Waste Management Program will be implemented in a Construction Waste Management Plan. Submit a Construction Waste Management Plan to the Contracting Officer for approval. Construction waste and demolition debris/waste materials include unused construction materials not incorporated in the final work, as well as demolition debris/waste materials from demolition activities or deconstruction activities. In the management of waste, consider the availability of viable markets, the condition of materials, the ability to provide material in suitable condition and in a quantity acceptable to available markets, and time constraints imposed by internal project completion mandates.

2. Oversight
   a. The quality Control Manager, as specified in Section 01 45 00 QUALITY CONTROL, is responsible for overseeing and documenting results from executing the Construction Waste Management Plan for the project. The Environmental Manager, as specified in Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS, is responsible for overseeing and documenting results from executing the Construction Waste Manager Plan for the project.

3. Special Programs
   a. Implement special programs involving rebates or similar incentives related to recycling of construction waste and demolition debris/waste materials. Retain revenue or savings from salvaged or recycling, unless otherwise directed. Ensure firms and facilities used for recycling, reuse and disposal are permitted for the intended use to the extent required by federal, state and local regulations.

4. Special Instructions
   a. Provide on-site of appropriate separation, handling, recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the projects. Designation of single source separating or commingling will be clearly marked on the containers.

5. Waste Streams
    a. Delineate waste streams and characterization, including estimated material types and quantities of waste, in the Construction Waste Management Plan. Manage all waste streams associated with the project. Typical waste streams are listed below. Include additional waste streams not listed:
        1) Land Clearing Debris
        2) Asphalt
        3) Masonry and CMU
        4) Concrete
        5) Metals (Includes, but is not limited to banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, bronze.)
        6) Wood (Nails and staples allowed.)
        7) Glass
        8) Paper
        9) Plastics (PET, HDPE, PVC, LDPE, PP, PS, Other)
        10) Gypsum
        11) Non-hazardous paint and paint cans
        12) Carpet
        13) Ceiling Tiles
        14) Insulation
        15) Beverage containers

1.5 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

1. Preconstruction Submittals
2. Construction Waste Management Plan
3. Test Reports
4. Quarterly Reports
5. Annual Report
6. Closeout Submittals
7. Final Construction Waste Diversion Report

1.6 MEETINGS

A. Conduct Construction Waste Management meetings. After award of the Contract and prior to commencement of work, schedule and conduct a meeting with the Contracting Officer to discuss the proposed Construction Waste Management Plan and to develop a mutual understanding relative to the management of the Construction Waste Management Program and how waste diversion requirements will be met. The requirements of this meeting may be fulfilled during the coordination and mutual understanding meeting outlined in Section 01 45 00 QUALITY CONTROL. At a minimum, discuss and document waste management goals at the following meetings:

1. Preconstruction/Pre-demolition meeting/
2. Regular site meetings.
3. Work safety meeting (if applicable).

1.7 CONSTRUCTION WASTE MANAGEMENT PLAN

A. Submit Construction Waste Management Plan within 45 calendar days after contract award. Revise and resubmit Construction Waste Management Plan as necessary, in order for construction to begin. Submit Construction Waste Management Plan not less than 60 calendar days before scheduled final site or building design approval. Revise and resubmit Construction Waste Management Plan until it receives final approval from the Contracting Officer, in order for construction to begin. Execute demolition or deconstruction activities in accordance with Section 02 41 00 DEMOLITION AND DECONSTRUCTION. Manage demolition debris/waste or deconstruction materials in accordance with the approved construction waste management plan.

B. An approved Construction Waste Management Plan will not relieve the Contractor of responsibility for compliance with applicable environmental regulations or meeting project cumulative waste diversion requirement. Also, include the following in the plan:

1. Identify the names of individuals responsible for waste management and waste management tracking, along with roles and responsibilities on the project.
2. Actions that will be taken to reduce solid waste generation, including coordination with subcontractors to ensure awareness and participation.
3. Description of the regular meetings to be held to address waste management.
4. Description of the specific approaches to be used in recycling/reuse of the various materials generated, including the areas on site and equipment to be used for processing, sorting, and temporary storge of materials.
5. Name of landfill and incinerator to be used.
6. Identification of local and regionals reuse programs, including non-profit organizations such as schools, local housing agencies and organization that accept used materials such as material exchange networks and resale stores. Include the name, location, phone number for each reuse facility identified, and provide a copy of the permit or license for each facility.
7. List of specific materials, by type and quantity, that will be salvaged for resale, salvaged and reused on the current project, salvaged and stored for reuse on a future project, or recycled. Identify the recycling facilities by name, address and phone number.
8. Identification of materials that cannot be recycled or reused with an explanation or justification to be approved by the Contractor Officer.
9. Description of the means by which materials identified in item (7) above will be protected from contamination.
10. Description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site.
11. Copy of training plan for subcontractors and other services to prevent contamination by co-mingling materials identified for diversion and waste materials.
12. Identification of at least (5) construction or demolition material streams for diversion.
13. Detailed plan and distribution of waste diversion between buildings, when project is a part of a campus.
14. Facilities or subcontractors offering construction waste transport on-site or off-site must ensure that proper shipping orders, bill of lading, manifests or other shipping documents containing waste diversion information meet requirements of 40 CFR 273 Universal Waste Management, 49 CFE 173 Shippers General Requirements for Shipments and

Packagings, and 49 CFR 178 Specifications for Packaging. Individuals signing manifests or other shipping documents should meet the minimum training requirements.

15. List each supplier who delivers construction materials, in bulk, or package products in returnable containers or returnable packaging, or have take-back programs. List each program and the applicable material to actively monitor and track to assist in meeting waste diversion requirements on the project.

16. Identify local jurisdiction requirements for waste management. Include local requirements and points of contact.

C. Distribute copies of the waste management plan to each subcontractor, Quality Control Manager/Environmental Manager and the Contracting Officer.

1.8 RECORDS

A. General

1. Maintain records to document the types and quantities of waste generated and diverted through reuse, recycling and sale to third parties; through disposal to a landfill or incinerator facility. Provide explanations for materials not recycled, reused or sold. Collect and retain manifests, weight tickets, sales receipts and invoices specifically identifying diverted project waste materials or disposed materials.

B. Accumulated

1. Maintain a running record of materials generated and diverted from landfill disposal, including accumulated diversion rates for the project. Make records available to the Contracting Officer during construction or incidental demolition activities. Provide a copy of the diversion records to the Contracting Officer upon completion of the construction, incidental demolitions or minor deconstruction activities.

1.9 REPORTS

A. General

1. Maintain current construction waste diversion information on site for periodic inspection by the Contracting Officer. Include in the quarterly reports, annual reports and final reports: project name, contract information, information for waste generated, diverted and disposed of for the current reporting period and show cumulative totals for the project. Reports must identify quantities of waste by type and disposal method. Also include in each report supporting documentation to include manifests, weigh tickets, receipts and invoices specifically identifying the project and waste material type and weighted sum.

B. Quarterly Reporting

1. Provide cumulative reports at the end of each quarter (December, March, June and September, corresponding with the federal fiscal year for reporting purposes). Submit quarterly reports not later than 15 calendar days after the preceding quarter has ended. Submit Quarterly Reports to the appropriate office or identified point of contact.

C. Annual Reporting

1. Provide a cumulative construction waste diversion report annually. Submit annual report not later than 30 calendar days after the preceding fourth-quarter has ended. Provide copy of annual construction waste diversion report to the installation point of contact.

1.10 FINAL CONSTRUCTION WASTE DIVERSION REPORT

A. A final Construction Waste Diversion Report is required at the end of the project. Provide Final Construction Waste Diversion Report (60) days prior to the Beneficial Occupancy Date. The Final Construction Waste Diversion Report must be included in the Sustainability eNotebook in accordance with Section 01 33 29 SUSTAINABILITY REQUIREMENTS AND REPORTING.

1.11 COLLECTION

A. Collect, store, protect and handle reusable and recyclable materials at the site in a manner which prevents contamination and provides protection from the elements to preserve their usefulness and monetary value. Provide receptacles and storage areas designated specifically for recyclable and reusable materials and label them clearly and appropriately to prevent contamination from other waste materials. Keep receptacles or storage areas near and clean.

B. Train subcontractors and other service providers to either separate waste streams or use the co-mingling method as described in the Construction Waste Management Plan. Handle hazardous waste and hazardous materials in accordance with applicable regulations and coordinate with Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS and Section 02 81 00 TRANSPORTATION AND DISPOSAL OF HAZARDOUS MATERIALS. Separate materials by one of the following methods described herein:

1. Source Separation Method
    a. Separate waste products and materials that are recyclable from trash and sort as described below into appropriately marked separate containers and then transport to the respective recycling facility for further processing. Deliver materials in accordance with recycling or reuse facility requirements (e.g., free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process). Separate materials into the category types as defined in the Construction Waste Management Plan.
2. Co-Mingled Method
    a. Place waste products and recyclable materials into a single container and then transport to an authorized recycling facility, which meets all applicable requirements to accept and dispose of recyclable materials in accordance with all applicable local, state and federal regulations. The co-mingled materials must be sorted and processed in accordance with the approved Construction Waste Management Plan.
3. Other Methods
    a. Other methods proposed by the Contractor may be used when approved by the Contracting Officer.

1.12 DISPOSAL

A. Control accumulation of waste materials and trash. Recycle or dispose of collected materials off-site at intervals approved by the Contracting Officer and in compliance with waste management procedures as described in the Waste Management Plan. Except as otherwise specified in other sections of the specifications, dispose of in accordance with the following:

1. Reuse
    a. Give first consideration to reusing construction and demolition materials as a disposition strategy. Recover for reuse materials, products and components as described in the approved Construction Waste Management Plan. Coordinate with

the Contracting Officer to identify onsite reuse opportunities or material sales or donation available through Government resale or donation programs. Sale of recovered materials is allowed on the installation. Consider the use of surplus industrial supply broker services, who match entities with reusable or repurpose industrial materials with entities with need of such materials.

2. Recycle
   a. Recycle non-hazardous construction and demolition/debris materials that are not suitable for reuse. Track rejection of contaminated recyclable materials by the recycling facility. Rejected recyclables materials will not be counted as a percentage of diversion calculation. Recycle all fluorescent lamps, HID lamps, mercury (Hg)-containing thermostats and ampoules, and PCBs-containing ballasts and electrical components as directed by the Contracting Officer. Do not crush lamps on site as this creates a hazardous waste stream with additional handling requirements.

3. Compost
   a. Consider composting on site if a reasonable amount of compostable materials will be available and a utilization of compostable material can be determined and appropriately planned for. Compostable materials include plan materials, sawdust and certain food scraps. Composting as a strategy must be explicitly addressed in the Construction Waste Management Plan submitted for approval to ensure it is feasible.

4. Waste
   a. Dispose by landfill or incineration only those waste materials with no practical use, economic benefit or recycling opportunity.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. See Division 1 Section “Payment Procedures” for requirements for Applications for Payment for Substantial and Final Completion.

C. See Division 1 Section “Project Record Documents” for submitting Record Drawings, Record Specifications, and Record Product Data.

D. See Division 1 Section “Operation and Maintenance Data” for operation and maintenance manual requirements.

E. See Division 1 Section “Demonstration and Training” for requirements for instructing Owner’s personnel.

F. See Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. 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.

C. The Architect will make one (1) inspection at Substantial Completion at the Architect’s cost.

1. For inspections in excess of the one (1), the Contractor shall reimburse the Owner, for additional services required of the Architect and the Architect’s consultants for these additional inspections.
2. The Architect will repeat inspection when requested and assured that the Work has been substantially completed.
3. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
2. Submit a final Application for Payment according to Division 1 Section “Payment Procedures.”
3. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
5. Submit pest-control final inspection report and warranty.

6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.

B. Inspection: Submit a written request for final inspection for acceptance. 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. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. For inspections in excess of the one (1), the Contractor shall reimburse the Owner for additional services required of the Architect and the Architect’s consultants for these additional inspections.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floor, equipment, and building systems.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

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 the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 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.

D. 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: Provide 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 portion of Project:
    a. Clean Project site, in areas disturbed by construction activities, including, of rubbish, waste material, litter, and other foreign substances.
    b. Remove tools, construction equipment, machinery, and surplus material from Project site.
    c. Clean exposed 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.
    d. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    e. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
    f. Remove labels that are not permanent.
    g. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    h. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    i. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    j. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    k. Clean light fixtures, lamps, and reflectors to function with full efficiency.
    l. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01 77 00

SECTION 01 78 10 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. See Division 1 Section “Operation and Maintenance Data” for operation and maintenance manual requirements.

C. See Divisions 2 through 16 Sections for specific requirements for project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

A. Record Drawings: Submit one set of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one copy of each Product Data submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the 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 understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.

d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Drawings: Immediately before inspection for Certificate of Substantial Completion, review marked-up Record Prints with Architect. When authorized, prepare a full set of corrected drawings of the Contract Drawings and Shop Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.

2. Refer instances of uncertainty to Architect for resolution.

3. Print the Contract Drawings and Shop Drawings for use as Record Drawings. Architect will make the Contract Drawings available to Contractor's print shop.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Transparencies: Organize into unbound sets matching Record Prints. Place transparencies in durable tube-type drawing containers with end caps. Mark end cap of each container with identification. If container does not include a complete set, identify Drawings included.

2. Identification: As follows:
a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

1. The Owner and Architect will periodically review record documents to assure compliance with this requirement.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 01 78 10

SECTION 01 78 20 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Emergency manuals.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, finishes, and systems and equipment.

B. See Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

A. Submission of Operating and Maintenance Manuals: When the HVAC systems are approximately 75 percent complete, submit four sets of manuals for Architect’s review.

1. Architect will submit one copy with review comments to the Owner for approval.

B. Initial Submittal: Include a complete operation and maintenance directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

C. Final Submittal:

1. Correct or modify each manual to comply with Architect's comments. Provide one electronic copy of the final manual on CDROM or Flash Drive in Adobe PDF format. Provide PDF bookmarks for each section and subsection of the manual. Submit corrected manual within 15 days of receipt of Architect's comments.
2. Include all of approved shop drawings and submittals organized and indexed into folders.

1.3 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

B. Purge manuals prior to submitting to Architect to include only technical data related to in-place construction.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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."

2.2 MANUALS, GENERAL

A. Organization: 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 a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
6. Name and address of Architect.
7. 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. Manuals, Electronic Files **(Digital Submittal Required)**: 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.

E. Manuals, Paper Copies **(Submit One Paper Copy)**: 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.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, gas leak, water leak, power failure, water outage, equipment failure, and chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.

B. Descriptions: Include the following:

1. Product name and model number.
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.

C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL

A. 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.

B. 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.

C. 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.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment.

D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance procedures.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.

G. Comply with Division 1 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 20

SECTION 01 82 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training videotapes.

B. See Divisions 2 through 16 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Demonstration and Training Videotapes: Submit four copies within seven days of end of each training module.

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 Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Pre-instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training.

D. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations, and provide a minimum of seven (7) days notice prior to any instruction.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

1. Motorized window shade systems.
2. Fire-protection systems, including fire alarm and fire-extinguishing systems.
3. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
4. HVAC instrumentation and controls.
5. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
6. Lighting equipment and controls.

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:

1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 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.

1. Owner will furnish an instructor to describe Owner's operational philosophy.

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 14 days' advance notice.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.

3.2 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.

1. Submit video recordings by uploading to web-based Project software site.
2. File Hierarchy: Organize folder structure and file locations in accordance with Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged in accordance with Project Manual table of contents:
   a. Name of Contractor/Installer.
   b. Business address.
   c. Business phone number.
   d. Point of contact.
   e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION – 01 82 00

SECTION 03 15 13 – CONCRETE WATERSTOPS

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 PVC waterstop embedded in concrete to create a continuous diaphragm to prevent liquid migration.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles for waterstops.

B. Shop Drawings: For each PVC waterstop.

1. Include construction joint types, layout, and locations of waterstops.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples for Verification: For each type of expansion joint cover assembly, full width by 4 inches (100 mm) long in size, clearly labeled with manufacturer's name and product identification.

D. Certification from manufacturer that waterstop meets or exceeds specified physical properties including conformance to Federal Specification SS-S-210A

E. Certification to hydrostatic pressure resistance of not less than 20 psi.

F. MSDS on waterstop strip primer adhesive.

1.4 QUALITY ASSURANCE

A. Waterstop Manufacturer shall demonstrate five (5) years minimum continuous, successful experience in production of PVC waterstops.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original undamaged containers, with manufacturer's labels and seals intact.

B. Store waterstops under tarps to protect from oil, dirt and sunlight.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Waterstops where new concrete curb meets the existing concrete slab: Subject to compliance with requirements, provide Basis of Design: Retrofit Waterstops by Sika, or comparable product.

B. Waterstops – new construction: Subject to compliance with requirements, provide Basis of Design: Non-Moving Joint Waterstops by Sika, Flat Ribbed, Profile #783, or comparable product.

2.2 RETROFIT WATERSTOPS

A. Profile: #581

B. Size: 3 inches height by 3 inches depth min.

C. Structural epoxy paste adhesive: Comply with ASTM C881, Type I, Grade-3, Class B/C; warranty to be provided; use only adhesive furnished or approved by waterstop manufacturer.

D. Anchor Bolt and Batten Bar: Stainless Steel, Type as required by waterstop manufacturer and warranty to be provided; use only adhesive furnished or approved by waterstop manufacturer.

2.3 NON-MOVING JOINT WATERSTOPS

A. Profile: #783, Flat Ribbed

B. Size: 6 inches length, 3/8 inch thickness min.

2.4 PERFORMANCE REQUIREMENTS

A. Water Absorption: ASTM D570, 0.15% max.

B. Tear Resistance: ASTM D624, 300 lb/in (52.5 kN/m) min.

C. Low Temperature Brittleness: ASTM D746, No Failure at -35°F (-37°C)

D. Stiffness in Flexure: ASTM D747, 700 psi (4.82 Mpa) min.

E. Ultimate Elongation: ASTM D638, 350% min.

F. Tensile Strength ASTM D638 2000 psi (13.78 Mpa) min.

G. Specific gravity ASTM D792 1.38 max.

H. Hardness Shore A15 ASTM D2240 79±3.

2.5 MATERIALS

A. The PVC waterstop shall be extruded from an elastomeric plastic material of which the basic resin is prime virgin polyvinyl chloride. The PVC compound shall **not contain any scrapped or reclaimed material or pigment.**

B. Stainless Steel: Batten Bars and Fasteners to be embedded in concrete.

2.6 ACCESSORIES

A. Provide **factory-made** waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.

B. Provide grommets, pre-punched holes, or hog rings (installed by others) spaced at 12 inches on center along length of waterstop.

C. Provide Teflon coated thermostatically controlled waterstop welding irons for field butt splices.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Ensure steel reinforcing bars do not interfere with proper position of waterstop.

B. Protect waterstops during progress of work.

C. Clean joints of dirt and construction debris.

D. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate installation of waterstops with placement of reinforcing steel and concrete.

B. Repair or replace waterstops having damage prior to the installation of concrete.

C. Clean all waterstops and accessories in accordance with recommendations of waterstops' manufacturer prior to the installation of concrete.

D. Structural epoxy paste adhesive:

1. Substrate: Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles and disintegrated materials.
2. Sandblast concrete substrate or use other approved mechanical means.
3. Mixing: Pre-mix adhesive components in accordance with adhesive's manufacturer's published instructions.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing PVC waterstops and materials unless more stringent requirements are indicated.

1. Field butt splices **shall be heat fused welded** using a Teflon coated thermostatically controlled waterstop welding iron at approximately 380 degrees F. Follow approved waterstop manufacturer recommendations.
2. **Lapping of waterstop, use of adhesives, or solvents shall NOT be allowed.**

B. Center waterstop in joint and secure waterstop in correct position using grommets, pre-punched holes, or hog rings (installed by others) spaced at 12 inches on center along the length of the waterstop and wire tie to adjacent reinforcing steel.

1. Place concrete without displacing waterstop from position.
2. Thoroughly and systematically vibrate concrete around waterstop to obtain impervious, void-free concrete in vicinity of joint and to maximize intimate contact between concrete and waterstop. Do not allow vibrator to contact the strip waterstop.

3.4 FIELD QUALITY CONTROL

A. Waterstop splicing defects which are unacceptable include, but are not limited to the following:

1. Tensile strength less than 80 percent of parent section.
2. Bond failure at joint deeper than 1/16 inch or 15 percent of material thickness.
3. Misalignment that reduces waterstop cross section more than 15 percent.
4. Visible porosity in the weld.
5. Bubbles or inadequate bonding.
6. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.
7. Charred or burnt material.

END OF SECTION 03 15 13

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Concrete toppings.

B. Products installed, but not furnished, under this Section include the following:

1. Anchor rods and embed plates indicated to be cast into cast-in-place concrete, furnished under Division 05 Section "Structural Steel Framing"

C. Related Sections:

1. Division 01 Section “Quality Requirements” for independent testing agency procedures and administrative requirements.
2. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 PERFORMANCE REQUIREMENTS

A. Moisture level in finished concrete shall be within limits acceptable to types of finish flooring indicated. Test methods and acceptable limits shall be as specified in Division 09 finish flooring Sections, or as required by finish flooring manufacturer's written product data or certified written statement. General Contractor is responsible for choosing and implementing methods of limiting excessive moisture during construction and curing, or remedial treatment, process, or other means to bring moisture level within acceptable limits, and for assigning and contracting for these responsibilities to installers

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.5 SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section “Quality Requirements”

B. Product Data:

1. Bar supports
2. Vapor retarders
3. Epoxy Bonding Adhesive
4. Cartridge Injection Adhesive
5. Form materials
6. Form-release agents
7. Evaporation retarder
8. Curing compound
9. Curing and sealing compound
10. Semirigid joint filler
11. Joint-filler strips
12. Waterstops
13. Controlled low-strength material, including design mixture.

C. Design Mixtures: For each concrete mixture.

1. Mix design submittals shall include test results and/or trial batch data that meet or exceed the required average compressive strength as required by ACI 301.
2. Trial batches shall consist of identical cementitious materials, fine and course aggregates, and admixtures to be used for mix design.
3. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
4. Design mixtures shall be coordinated with means of transport from point of delivery to point of placement. Allowances shall be made for changes in properties due to means of transport (from point of delivery to point of placement).
5. For mixes to be transported (i.e. pumped) from point of delivery to point of placement include a statement as to the expected property changes (i.e. unit weight and air content) from point of delivery to point of placement.Steel Reinforcement Shop Drawings:

1. Drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and bar supports for concrete reinforcement.
3. Identify all step footing locations and associated reinforcing
4. Identify and dimension all grade beam and tie beam construction joints
5. Include slab on grade construction joint reinforcement
6. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

    a. Location of construction joints is subject to approval of the Architect.

E. Qualification Data:

1. For ready-mix concrete manufacturer.
2. For Cartridge injection adhesive installer. Include manufacturer's training certificates or letter from manufacturer certifying training was complete with a list of individuals that were trained

F. Material Certificates: For each of the following indicating compliance with the required standards and signed by manufacturers:

1. Vapor retarders

G. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Capillary Barriers

H. Research/Evaluation Reports:

1. Submit ICC reports for the following:

a. Cartridge Injection Adhesive
b. Mechanical Couplers (As used)
c. Form Saving Mechanical Couplers (As used)
d. Mechanical End Anchors (As used)

I. Hot Weather Program (As required, see below):

1. Describe in detail procedure for working in Hot Weather when concrete temperatures exceed the specified limits. Included detailed description of methods, materials, and equipment to be used to comply with requirements.

J. Substitutions for Cartridge Injection Adhesive:

1. Substitution requests may only be made using products with ICC-ESR reports for the product in the specific substrate.
2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code.
3. Substitution request shall specify the diameter and embedment depth of the substituted product
4. Any increase in material cost resulting from the substitution shall be the responsibility of the contractor.

K. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Installer Qualifications: The installer shall be experienced placing, finishing, curing, treating and protecting concrete equal in material, design and scope to that required for this project

C. Cartridge Injection Adhesive Installer Training: Conduct a thorough training session with the manufacturer's representative. Each individual responsible for the installation of anchors shall attend the training session. Training shall consist of a review of the complete process for the installation of the anchors and the use of proper equipment for drilling and installing the anchors, to include but not limited to:

1. Hole drilling procedure. Clarify acceptability of rotary hammer drilling and/or core drilling.
2. Hole drilling equipment
3. Type and diameter of drill bits
4. Hole preparation and hole cleaning technique
5. Hole cleaning equipment

6. Adhesive injection technique
7. Adhesive injection equipment
8. Adhesive curing requirements

D. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

E. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

F. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

G. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 318, “Building Code Requirements for Structural Concrete”.

H. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement:

1. Deliver, store, and handle steel reinforcement to prevent bending and damage.
2. Maintain reinforcement free of dirt and other deleterious materials.
3. Store reinforcing on dunnage or other supports up off of ground.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 REINFORCEMENT

A. Typical Reinforcing Bars:

1. ASTM A 615/A 615M, deformed, Grade 60.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Concrete Brick, Standees, Bolsters, chairs, spacers, supplementary reinforcing steel and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place including measures for supporting and anchoring reinforcing intermediate and top layers of reinforcing. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. Concrete brick supports are limited to use in supporting the bottom mat of below grade foundation reinforcing steel. Concrete brick supports shall consist of solid units of unit strength equal to or greater than associated foundation concrete. Submit material test reports for approval.

C. Cartridge Injection Adhesive: A two part adhesive injection system for anchorage of new reinforcing steel to existing concrete construction.

1. Where adhesive manufacturer is not indicated, subject to compliance with requirements and acceptance by the Architect, provide the following or approved equal:

   a. Hilt HIT RE 500 V3 Adhesive Anchorage System, ICC ESR-3814.

2. Where specifically indicated in the contract documents provide the following:

   a. Hilti HIT –HY 200 Adhesive Anchorage System, ICC ESR-3187

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, Type I/II or Type III unless noted otherwise.
2. Blended Hydraulic Cement: ASTM C595, Type IL or Type IP

   a. Type IS and Type IT are NOT permitted

3. Fly Ash: ASTM C 618, Class F.

B. Normal-Weight Aggregates: ASTM C 33, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Coarse Aggregate

   a. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
   b. Class: Per ASTM C33 requirements for the concrete use and region of the project

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Accelerating Admixture: Non-Chloride, ASTM C494/494M, Type C.
4. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Profile: Ribbed without center bulb unless noted otherwise.
2. Dimensions: 4 inches by 3/16 inch thick unless noted otherwise; nontapered.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, minimum 15 mil thickness.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Stego Industries LLC; Stego Wrap 15-Mil Vapor Barrier.
b. Fortifiber Corporation; Moistop Ultra A.
c. Raven Industries Inc.; Vapor Block 15.
d. Reef Industries, Inc.; Griffolyn Type-65G.
e. W.R. Meadows, Inc.; Sealtight Vapormat 15.
f. Poly-America; Yellow Guard 15.

2. Seam Tape: Manufacturer's recommended adhesive or pressure-sensitive tape.

2.8 CAPILLARY BARRIERS:.

A. A clean, compactable and trimmable granular fill with material passing the No. 200 sieve having less than 3 percent clay or friable particles. The material shall remain stable and support construction traffic and complying with one of the following:

1. A local state DOT approved road base material with 100 percent passing the 1 ½" sieve, 15 to 55 percent passing the No. 4 sieve, and less than 5% passing the No. 200 sieve.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: Provide one of the following.

1. Flexible lightweight, non-staining, polythelene, closed cell, non-absorbent, uv stable, compressible foam with a pre-scored removable strip to allow for clean and uniform sealant joint as follows:
    a. Density: ASTM D1751
    b. Compression: ASTM D3575
        1) 10% Deflection: 10 psi maximum
        2) 80% Deflection: 126 psi maximum
    c. Water absorption: ASTM D3575, 0.5% volume maximum
2. Resilient, flexible, non-extruding, asphalt-saturated cellulosic fiber with preformed cap to allow for clean and uniform sealant joint
    a. Density: ASTM D 1751

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Type V, for bonding freshly mixed concrete to hardened concrete.

2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Compressive Strengths: Compressive strengths specified are as required for structural design. Compressive strength provided shall be increased as required by ACI 318 for exposure class or as required for specialty treatments or finishing of concrete (i.e. polishing)

C. Air Content: Shall be adjusted as required for exposure class, specialty treatments or finishing of concrete.

D. Exposure Class: Unless noted otherwise in drawings or specifications concrete shall be considered exposure class F0, S0, W0 and C0.

E. Coordination with means of transport (from point of delivery to point of placement):

1. Design mixtures shall be coordinate with means of transport from point of delivery to point of placement. Allowances shall be made in the mix design for changes in properties due to means of transport (from point of delivery to point of placement). Specifically an allowance shall be made for loss of air entrainment due to transport methods (i.e concrete pump) when air entrainment is explicitly specified or where air entrainment is used as part of achieving lightweight concrete.
2. Coordinate with schedule of special inspections for instances in which concrete properties are to be explicitly confirmed at point of placement.

F. Admixtures: Use admixtures as noted in mix design and according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use accelerating admixture in concrete as required for cold weather conditions.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Dry Unit Weight: 145 lb/cu. ft. plus or minus 3 lb/cu. ft.
3. Exposure Classes:

    a. Freeze/Thaw Exposure: F0
    b. Sulfate Exposure: S0
    c. Water Contact Exposure: W0
    d. Corrosion Exposure: C0

B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength:

    a. Typical Slabs: 4000 psi at 28 days.

2. Dry Unit Weight: 145 lb/cu. ft. plus or minus 3 lb/cu. ft.
3. Air Content:

    a. Coordinate target air content with exposure requirements
    b. Maximum air content for slabs to receive trowel finish shall be 3 percent at point of placement.

4. Cementitious Materials:

    a. Minimum Cementitious Materials Content: Per ACI 301 requirements based on max aggregate size
    b. For slabs to receive a polished finish fly ash shall not be permitted

5. Exposure Classes:

    a. Freeze/Thaw Exposure: F0
    b. Sulfate Exposure: S0
    c. Water Contact Exposure: W0
    d. Corrosion Exposure: C0

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. Unless a detailed hot weather concrete plan incorporating the recommendations of ACI 305 has been submitted and approved comply with the following:

a. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes.
b. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

2.15 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, [Type I] [Type II] [or] [Type III].
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94/C 94M.
6. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C 495.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Smooth-formed finished surfaces: Class A, 1/8 inch
2. Rough-formed finished surfaces: Class D, 1 inch

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Anchor rods and embeds shall be securely fastened in formwork prior to placing concrete, and concrete vibrated around the anchor or embed to ensure proper flow of concrete around anchors and embeds.
3. Anchor rod sleeves (where required) shall be accurately located and fastened in formwork prior to placing concrete.
4. Wet setting of anchor rods and embeds is not permitted.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Place vapor retarder with longest dimension parallel to direction of pour and face laps away from the expected direction of placement whenever possible.
2. Lap joints per manufacturer, but not less than 6 inches and seal with manufacturer's recommended tape or adhesive.
3. Extend vapor retarder to edge of slab in all cases.
4. At conditions terminating into a wall turn vapor retarder up wall, extend to top of slab and seal to wall with manufacturer’s tape or mastic unless obstructed by dowels, waterstops or other elements or unless specifically required otherwise by manufacturer.
    a. Where specific conditions prevent turning vapor retarder up and sealing submit specific procedure for turning vapor retarder down and sealing to wall or footing.
5. Manufacturer’s seam tape or mastic shall be applied to clean and dry vapor retarder in strict accordance with manufacturer’s recommendations.
6. Seal all penetrations including pipes and permanent stakes per manufacturer’s instructions.
7. Do not use non-permanent stakes driven through the vapor retarder.
8. Repair damaged areas with vapor retarder patch of the typical vapor retarder material sealed with manufacturer’s tape or mastic in strict accordance with manufacturer’s recommendations for repair.

3.6 CAPILLARY BARRIERS:

A. General: Place capillary barrier on compacted subgraded beneath vapor retarder for all slabs on grade unless noted otherwise.

1. Compact capillary barrier with mechanical equipment to an elevation tolerance of plus 0 and minus ¾ inch.
2. Capillary barriers are not required where mud slabs and below slab sheet waterproofing are indicated.
3. Ensure surface of capillary barrier is uniform to prevent damage to vapor retarders.
4. Ensure capillary barrier is compacted to a uniform surface free of ruts, divots or other anomalies from construction traffic. Repair any anomalies immediately prior to concrete placement.

3.7 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Anchorage of reinforcement into hardened concrete using cartridge injection adhesive anchors shall only be used where specifically indicated on plans or with written direction from the Engineer of Record for a specific location.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Foundation reinforcing steel may be supported on solid concrete brick units of strength equal to or greater than foundation concrete.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Welded Wire Reinforcement:

1. Install welded wire reinforcement in longest practicable lengths
2. Locate welded wire reinforcement in top 1/3 of slab on grades unless noted otherwise
3. Locate welded wire reinforcement at mid-depth of concrete slab thickness over deck flutes unless noted otherwise.
4. Lap edges and ends of adjoining sheets at least one mesh spacing plus 2”, but not less than 6”. Lace overlaps with wire.
5. Slabs on Grade 4” or less in thickness: Support welded wire reinforcement on chairs, bolsters or bar supports spaced to minimize sagging, and as required to support construction traffic
    a. Alternately, welded wire reinforcement may be placed on grade and “hooked”/pulled to the proper location
    b. Placement of welded wire reinforcement after placement of concrete and “walking in” is not permitted.
6. Slabs on Grade greater than 4” in thickness: Support welded wire reinforcement on chairs, bolsters or bar supports spaced to minimize sagging, and as required to support construction traffic
    a. Placement of welded wire reinforcement on grade and “hooked”/pulled up into slab as concrete is placed is not permitted.

b. Placement of welded wire reinforcement after placement of concrete and “walking in” is not permitted.

7. Elevated slabs: Support welded wire reinforcement on chairs, bolsters or bar supports spaced to minimize sagging, and as required to support construction traffic

a. Alternately, welded wire reinforcement may be placed on deck and “hooked”/pulled to the proper location
b. Placement of welded wire reinforcement after placement of concrete and “walking in” is not permitted.

3.8 CARTRIDGE INJECTION ADHESIVE

A. Where manufacturer recommends the use of special tools for installation of anchors, such tools shall be used.

B. All facets of hole drilling, hole cleaning, anchor installation, anchor torqueing shall be in strict accordance with the ICC-ESR report and manufacturer’s data.

C. Drill holes perpendicular to substrate surface.

D. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits as indicated in the ICC-ESR report.

E. Drill bits and core bits shall be of diameters indicated in the ICC-ESR report.

F. All holes shall be cleaned with compressed air to remove all drilling dust and other deleterious substances.

G. Remove water from holes to attain a surface dry condition unless specifically permitted otherwise by ICC-ESR report.

H. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete has achieved full design strength.

I. Hilti HIT-HY200 system adhesive shall be installed using the Hilti Safe Set Technology.

1. The Hilti hollow drill bit and Hilt vacuum system shall be employed.

J. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

K. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

L. Follow manufacturer recommendations to ensure proper mixing of adhesive components.

M. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface.

N. Remove excess adhesive from the surface.

O. Shim reinforcement with suitable device to center the reinforcement in the hole.

P. Do not disturb or load reinforcment before manufacturer specified cure time has elapsed.

Q. Observe manufacturer recommendations with respect to installation temperatures.

3.9 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Provide supplemental reinforcing and/or smooth dowels where indicated at joints.
4. Strip bulkheads from footings, beams, grade beams, tie beams, and slabs and roughen surface of concrete to a minimum 1/4" amplitude while concrete is still plastic.
5. Form keyed joints unless indicated otherwise. Embed keys at least 1-1/2 inches into concrete unless noted otherwise.
6. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
7. Locate joints in slabs on steel deck as follows:
    a. Joints parallel to joists (perpendicular to girders) shall be located at the midpoint between two adjacent joists.
    b. Joints parallel to girders (perpendicular to joists) shall be located at the midpoint of two adjacent girders.
    c. Stagger and offset joints as required to meet the requirements.
8. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
9. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
10. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least [one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete.
    a. Cut joints as soon as cutting action will not tear, abrade, or otherwise damage surface , but not more than 12 hours after finished, and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.10 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

1. Coordinate location of waterstop in concrete cross section with manufacturer’s requirements with careful attention given to clear cover requirements and location with respect to reinforcing steel.

3.11 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 and as follows.

1. Do not add water to concrete unless the batched water is specifically noted as less than the mix design and is indicated as such on the batch ticket.
2. Do not add more water than the amount of withheld water which is specifically identified on the batch ticket.
3. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 305.1 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement unless a detailed hot weather concrete plan incorporating the recommendations of ACI 305.1 has been submitted and approved. At no time shall concrete temperature exceed 95 deg F at time of placement.
2. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.12 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to be covered with a coating or covering material applied directly to concrete coordinate with Architectural drawings and specifications.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent

formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.13 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Finishing Tolerances:

1. Horizontal finishes will be accepted provided:

a. Applicable specification requirements are satisfied.
b. Water does not pond in areas sloped to drain.
c. Floor finish tolerances Ff/Fl for each completed floor area conform to the values indicated
d. Mean Local values for Flatness and Levelness are satisfied at all locations tested.
e. Accumulated deviation from intended true plane of finished surface does not exceed 1 inch.
f. Accuracy of concrete finish does not adversely affect installation and operation of movable equipment, floor supported items or items fitted to floor (doors, tracks, etc.).

C. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces to receive concrete floor toppings or to receive mortar setting beds for bonded cementitious floor finishes.

D. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish, trowel and fine broom finish, or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
2. Apply to mud slabs.

E. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, epoxy terrazzo, polished or another thin-film-finish coating system.
2. Grind off any defects which would indicate through thin floor covering.
3. Finish surfaces to the following tolerances as measured by ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

a. Slabs on Grade: Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

b. Unshored Elevated Slabs: Specified overall values of flatness, F(F) 35 with minimum local values of flatness, F(F) 24.

F. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method without cleavage membrane. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

G. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.14 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.15 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Foundations:

1. Protect top sides of footings to receive masonry or concrete construction from dirt and debris.
2. Excavations:
    a. Do not allow excavations directly adjacent to or beneath footings to the absolute greatest extent possible.
    b. Where excavations must occur beneath in place footings or slabs the area shall be careful excavated as to not damage structural elements. The area shall be backfilled and compacted at the end of the work day.
    c. Areas excavated below footings shall be backfilled with Controlled Low-Strength Material.
    d. Areas excavated adjacent to and at or below footing elevation shall be backfilled with Controlled Low-Strength Material unless the area is large enough to be backfilled with control fill in lifts attaining proper compaction between lifts.

F. Slabs:

1. Protect slabs to remain expose, stained or receive other non-opaque floor coverings or treatments with impervious covers to prevent staining of the slab
2. Do not allow construction equipment or vehicles to drive on slabs.
3. Excavations:
    a. Do not allow excavations directly adjacent to or beneath slabs on grade to the absolute greatest extent possible.
    b. Where excavations must occur beneath in place footings or slabs the area shall be careful excavated as to not damage structural elements. The area shall be backfilled and compacted at the end of the work day.
    c. Areas excavated below slabs shall be backfilled with Controlled Low-Strength Material. Areas excavated adjacent to and at or below slab elevation shall be backfilled with Controlled Low-Strength Material unless the area is large enough to be backfilled with control fill in lifts attaining proper compaction between lifts.
    d. Repair vapor retarders per manufacturer's requirements

G. Cure concrete according to ACI 308.1, as follows:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments or polished finish.
    b. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

   a. Apply curing and sealing compound to areas of exposed concrete not to receive any floor treatment, staining, painting or floor covering. Coordinate with finish schedule.

3.16 CONCRETE REPAIRS

A. Where deficient concrete is identified on the job all repairs shall be subject to the EOR and AOR approval.

B. The contractor shall be responsible for enlisting a concrete repair specialists with no less than 5 years of documented concrete repair service and having repaired deficient conditions similar to those identified on no less than 5 projects in the previous five years.

C. The contractor and repair specialists shall prepare a narrative of the proposed repair including detailed methods and material, and submit for EOR approval prior to commencing with repairs.

D. Where repair of deficient work is to remain exposed, the deficient work shall be removed and replaced as directed by the EOR.

3.17 JOINT FILLING

A. Fill all joints in exposed concrete slabs

B. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

D. Install semirigid joint filler full depth in saw-cut joints and at least 1 deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.18 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 05 05 20 - POST INSTALLED STRUCTURAL ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wedge anchors
2. Cartridge injection adhesive anchors
3. Screw Anchors

B. This specification section is only intended for use when specifically required by the drawings or other referencing specifications and structural applications. This section is not intended for use in non-structural applications or where not specifically referenced by the drawings or other specification sections.

C. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Structural Steel Framing" for anchorage of structural steel.
3. Division 05 Section "Cold Formed Metal Framing" for anchorage of cold form metal framing where specifically detailed in the contract documents.
4. Division 05 Section "Engineered Cold Formed Metal Framing" for anchorage of performance based cold form metal framing.

1.3 PERFORMANCE REQUIREMENTS

A. The basis of design products are as specified in this specification or the contract documents. Product substitutions must have capacities equal to or greater than values calculated for each specific condition calculated when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code. See requirements for substitution submittals.

1.4 DEFINITIONS

A. Post Installed Structural Anchors: Anchors supporting and/or anchoring structural elements of the building which are installed into hardened concrete or masonry and that are specified in the contract documents or performance based shop drawing design submittals for structural elements.

B. Wedge Anchors: A torque-controlled anchor, with an integral cone expander and single piece steel expansion clip providing 360-degree contact with the base material while not requiring

oversized holes for installation and an impact section to prevent thread damage with required nuts and washers.

C. Cartridge Injection Adhesive Anchors: An anchor system consisting of rod insert, nut, washer and a cartridge type, two-component polymer or hybrid mortar adhesive system dispensed and mixed through a static mixing nozzle supplied by the manufacturer.

D. Screw Anchor: A continuously threaded anchor designed to be installed in predrilled hole with threads cutting into the sides of the hole and interlocking into the base material during installation.

1.5 SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section "Quality Requirements"

B. Product Data:

1. Wedge Anchors
2. Cartridge Injection Adhesive Anchors
3. Screw Anchors

C. Research/Evaluation Reports:

1. Submit ICC reports for the following:

a. Wedge Anchors
b. Cartridge Injection Adhesive Anchors
c. Screw Anchors

D. Substitutions:

1. Substitution requests may only be made using products with ICC-ESR reports for the product in the specific substrate.
2. Substitution request shall include signed and sealed calculations demonstrating that the product is capable of providing equivalent performance of the specified product for each specific location and condition when calculated using the data in the referenced ESR report and in accordance with the appropriate design procedure and standards required by the building code.
3. Substitution request shall specify the diameter and embedment depth of the substituted product
4. Any increase in material labor cost resulting from the substitution shall be the responsibility of the contractor.

E. Manufacturer's Instruction: Manufacturer's Installation Instructions

F. Qualification Data: Submit installer qualification data as stated in Quality Assurance section. Qualifications shall be submitted in a letter format for each type of anchor to be installed, and shall include the following:

1. The specific product to be used
2. Complete description of installation procedure
3. Personnel to be trained on anchor installation
4. Date of Manufacturer training
5. Manufacturer's training certificates or letter from manufacturer certifying training was complete with a list of individuals that were trained.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

   a. Coordinate meeting with individual preinstallation conferences for specific material and technical specification sections

B. Installer Qualifications: The installer shall be experienced in installing anchors equal to type, and into the substrate material required for this project

C. Installer Training: Conduct a thorough training session with the manufacturer's representative. Each individual responsible for the installation of anchors shall attend the training session. Training shall consist of a review of the complete process for the installation of the anchors and the use of proper equipment for drilling and installing the anchors, to include but not limited to:

   1. Hole drilling procedure. Clarify acceptability of rotary hammer drilling and/or core drilling.
   2. Hole drilling equipment
   3. Type and diameter of drill bits
   4. Hole preparation and hole cleaning technique
   5. Hole cleaning equipment
   6. Adhesive injection technique
   7. Adhesive injection equipment
   8. Anchor rod, nut and washer material requirements and associated cleaning requirements
   9. Anchor and Anchor rod installation
   10. Anchor tightening
   11. Adhesive curing requirements

D. Certifications: All anchors shall have an ICC ESR Evaluation report indicating conformance with the current applicable Acceptance Criteria for the building code applicable to the project.

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.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Keep anchors, rod materials, nuts and washers in manufacturer's packaging with label intact until needed for use.

B. Keep anchors free of dirt and debris.

C. Store anchors in a clean dry area

D. Protect anchors from corrosion and deterioration.

E. Store anchors and adhesives in strict accordance with manufacturer's requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Nuts: Having a proof load stress equal or greater than the minimum tensile strength of the associated anchor where type and strength is not specifically indicated by anchor or adhesive manufacturer.

B. Washers: Of type and material compatible with nuts unless specifically indicated by anchor or adhesive manufacturer.

C. Plate Washers: Provide ASTM A 36 plate washers of size and configuration specifically indicated.

2.2 CORROSION RESISTANCE

A. Anchors and Anchor Bodies

1. Uncoated Carbon Steel: Carbon steel anchors uncoated and free from oil, lubricants and other deleterious substances.Acceptable for use as follows:

    a. Interior dry conditions

2. Zinc Plated: Zinc plating in accordance with ASTM B633, Type III Fe/Zn 5 (SC1) Acceptable for use as follows:

    a. Interior dry conditions

3. Galvanized: Carbon steel anchors hot-dipped galvanized in accordance with ASTM A 153 or ASTM F2329 or mechanically galvanize in accordance with ASTM B695 Class 55. Acceptable for use as follows:

    a. Interior dry conditions
    b. Exterior conditions
    c. Anchoring galvanized steel elements

4. Stainless Steel: AISI Type 316 stainless steel and complying with ASTM F 593. Acceptable for use as follows:

    a. Anchoring treated lumber elements
    b. Anchoring stainless steel elements
    c. Anchoring aluminum elements or in contact with aluminum elements.

B. Nuts

1. Uncoated carbon steel: Acceptable for use as follows:

    a. With Uncoated Anchors

2. Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:

    a. With Zinc Plated Anchors
    b. With Galvanized Anchors

3. Stainless Steel: ASTM F594. Acceptable for use as follows:

    a. With Stainless Steel Anchors

C. Washers

1. Uncoated carbon steel: Acceptable for use as follows:
    a. With uncoated anchors
2. Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:
    a. With Galvanized Nuts
3. Stainless Steel: AISI Type 316 stainless steel. Acceptable for use as follows:
    a. With Stainless Steel Nuts

D. Plate Washers:

1. Uncoated carbon steel: Acceptable for use as follows:
    a. With Uncoated Nuts
2. Galvanized: Hot-dipped galvanized in accordance with ASTM A 153. Acceptable for use as follows:
    a. With Galvanized Nuts

2.3 WEDGE ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC01 or ICC-ES AC193 as appropriate based on the anchor substrate..

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Concrete Anchors:

1. Anchors shall be tested in accordance with ACI 355.2 and the most recent issue of ICC-ES AC193 including the following:
    a. All mandatory testing
    b. Shear and tension in cracked concrete.
    c. Critical and minimum edge distances and spacing
2. Anchors design shall be in accordance with ACI 318 Chapter 17
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:
    a. Zinc Plated Conditions: Hilti Kwik Bolt TZ2 with nut and washer, of required finish, ICC ESR-4266
    b. Galvanized Conditions: Not Permitted
    c. Stainless Steel Conditions: Not permitted
    d. Approved equal (See substitution requirements)

E. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC01 (cracked and uncracked) including the following

   a. All mandatory testing
   b. Seismic tension and shear
   c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with TMS 402
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

   a. Zinc Plated Conditions: Hilti Kwik Bolt 1 with nut and washer, of required finish, , IAPMO ER-677
   b. Galvanized Conditions: Not Permitted
   c. Stainless Steel Conditions: Not permitted
   d. Approved equal (See substitution requirements)

2.4 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC58 or ICC-ES AC308.

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Adhesive: Two component epoxy or two component hybrid system.

E. Concrete Anchors:

1. Anchors shall be tested in accordance with the most recent issue of ICC-ES AC308 including the following:

   a. All mandatory testing
   b. Shear and tension in cracked concrete.
   c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 318 Chapter 17 as amended by the specific design provisions of ICC-ES AC308
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

   a. Rods, washers, and nuts of required finish with Hilti HIT RE 500 V3 Adhesive Anchorage System for anchorage to concrete, ICC ESR-3814.
   b. Rods (Unless Noted Otherwise):

      1) Carbon Steel Rods: ASTM A193 B7 coated as required for use
      2) Galvanized: ASTM F1554 Grade 36
      3) Stainless Steel Rods: ASTM F593, Type 316, CW

c. Approved equal (See substitution requirements)

F. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC58 including the following

   a. All mandatory testing
   b. Seismic tension and shear
   c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with TMS 402
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

   a. Grouted Masonry: HAS-E Standard or HAS SS rods, washers, and nuts of required finish with Hilti HIT HY 270 Adhesive Anchorage System for anchorage to masonry, ICC ESR-4143.
   b. Rods (Unless Noted Otherwise):

      1) Carbon Steel Rods: ASTM A193 B7 or ASTM F1554 Grade 36
      2) Galvanized: ASTM F1554 Grade 36
      3) Stainless Steel Rods: ASTM F593, Type 316, CW

   c. Approved equal (See substitution requirements)

2.5 SCREW ANCHORS

A. Provide anchors with length identification markings conforming to ICC-ES AC01 or ICC-ES AC193 as appropriate based on the anchor substrate..

B. Size: As indicated on drawings

C. Embedment depth: As indicated on the drawings but not less than the manufacturer's documented minimum embedment depth. Where not specifically indicated use manufacturer's minimum documented embedment depth.

1. Embedment depth is from surface of concrete or masonry. Anchor lengths and extent of threads shall account for embedment depth, connected elements, plate washers, washers, nut and appropriate stick thru.

D. Concrete Anchors:

1. Anchors shall be tested in accordance with ACI 355.2 and the most recent issue of ICC-ES AC193 including the following:

   a. All mandatory testing
   b. Shear and tension in cracked concrete.
   c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with ACI 318 Chapter 17
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

   a. Zinc Plated Conditions: Hilti KH-EZ, ICC ESR 3027
   b. Galvanized Conditions: Hilti KH-EZ CRC, ICC ESR 3027
   c. Stainless Steel Conditions: Hilti KH-EZ SS316, ICC ESR 3027
   d. Approved equal (See substitution requirements)

E. Masonry Anchors:

1. Anchors for masonry shall be tested in accordance with most recent edition of ICC-ES AC01 (cracked and uncracked) including the following

   a. All mandatory testing
   b. Seismic tension and shear
   c. Critical and minimum edge distances and spacing

2. Anchors design shall be in accordance with TMS 402
3. Where not specifically indicated otherwise in contract documents or approved performance based shop drawings submittal anchors shall be as follows:

   a. Zinc Plated Conditions: Hilti KH-EZ, ICC ESR 3056
   b. Galvanized Conditions: Hilti KH-EZ CRC, ICC ESR 3056
   c. Stainless Steel Conditions: Hilti KH-EZ SS316, ICC ESR 3056
   d. Approved equal (See substitution requirements)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.
2. Installation constitutes acceptance of existing conditions and responsibility of satisfactory performance.

3.2 INSTALLATION, GENERAL

A. Corrosion Resistance: Care shall be taken to ensure an anchor and associated accessories of the proper material and associated corrosion resistance are used for the specification application. See corrosion resistance requirements above.

B. Where manufacturer recommends the use of special tools for installation of anchors, such tools shall be used.

C. Match mark and drill, match drill or use other methods to ensure anchors are properly located.

D. Do not adjust anchor location after installation. Coordinate with EOR for modifications to connected element where anchors are incorrectly located.

E. All facets of hole drilling, hole cleaning, anchor installation, anchor torqueing shall be in strict accordance with the ICC-ESR report and manufacturer’s data.

F. Drill holes perpendicular to substrate surface.

G. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits as indicated in the ICC-ESR report.

H. Drill bits and core bits shall be of diameters indicated in the ICC-ESR report.

I. All holes shall be cleaned with compressed air to remove all drilling dust and other deleterious substances.

J. Remove water from holes to attain a surface dry condition unless specifically permitted otherwise by ICC-ESR report.

K. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

L. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling. Take precautions as necessary to avoid damaging prestressing tendons, electrical and telecommunications conduit, and gas lines.

M. Perform anchor installation in strict accordance with manufacturer instructions and ICC-ES report.

N. Anchors shall be installed perpendicular to the substrate face within plus or minus 5 degrees unless specifically permitted otherwise by ICC-ESR report.

O. Install plate washers where specifically indicated or where connected elements have oversized holes.

P. Install a round washer under nuts. Round washers are in addition to plate washers where plate washers are required.

3.3 WEDGE ANCHORS

A. Protect threads from damage during anchor installation.

B. Set anchors to manufacturer’s recommended torque, using a torque wrench. Following attainment of 10% of the specified torque, 100% of the specified torque shall be reached within 7 or fewer complete turns of the nut. If the specified torque is not achieved within the required number of turns, the anchor shall be removed and replaced unless otherwise directed by the Engineer.

3.4 CARTRIDGE INJECTION ADHESIVE ANCHORS

A. Clean all holes per manufacturer instructions using manufacturer’s approved tools to remove loose material and drilling dust prior to installation of adhesive.

B. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

C. Follow manufacturer recommendations to ensure proper mixing of adhesive components.

D. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface.

E. Remove excess adhesive from the surface.

F. Shim anchors with suitable device to center the anchor in the hole.

G. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

H. Observe manufacturer recommendations with respect to installation temperatures.

I. Hilti HIT-HY200 system anchors shall be installed using the Hilti Safe Set Technology.

1. For conditions using HAS rods the Hilti hollow drill bit and Hilt vacuum system shall be employed.

3.5 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Remove and replace misplaced or malfunctioning anchors. Fill empty anchor holes and patch failed anchor locations with high-strength non-shrink, nonmetallic grout. Anchors that fail to meet proof load or installation torque requirements shall be regarded as malfunctioning.

B. Galvanizing Repairs: Prepare and repair damaged galvanized coatings with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 12 00 - STRUCTURAL STEEL 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. Structural Steel
2. Bearing Plates
3. Nonshrink Grout

B. Products furnished, but not installed under this Section:

1. Anchor rods with setting templates and embed plates indicated to be cast into cast-in-place concrete, installed under Division 03 Section "Cast-in-place-Concrete"

C. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Architecturally Exposed Structural Steel" for additional requirements for architecturally exposed structural steel.
3. Division 05 Section "Metal Stairs."
4. Division 05 Section "Post Installed Structural Anchors" for wedge, screw, and adhesive anchors
5. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for special surface-preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges" and as modified herein.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using AISC 360 .
2. Use LRFD; data are given at factored-load level.
3. All bolted connections for bracing members shall be designed and fabricated as slip critical connections to allow for field reaming of holes to address fit up issues.
4. The minimum number of bolts for any connection shall be two.

5. All steel to steel connections shall extend at least two thirds of the depth of the supported member being connected.
6. All connections shall be designed to fit within the confines of concealed spaces unless specifically noted as acceptable to be exposed to view.
7. Connections shall allow for flush deck bearing at top flange of all beams beneath deck. If cover or flange plates are used a method for flush deck support around the cover/flange plate shall be provided at no cost to the owner.

1.5 SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section "Quality Requirements"

B. Fabricator’s Certificate of Compliance Per Division 01 Section "Quality Requirements"

C. Quality Control Plan: Job specific Quality Control Plan for Fabricator, Erector including qualification data for the following:

1. Fabricator
    a. Testing personnel.
    b. Inspection personnel
2. Erector
    a. Inspection personnel

D. Weekly Inspection reports for Shop Fabricated Steel

E. Nonconformance reports for Shop Fabricated Steel

F. Product Data:

1. Primers
2. Electrodes
    a. Indicate what welding process will be used with each electrode
    b. Submit electrodes for both shop and field welding
3. Bolts, nuts, and washers including mechanical properties and chemical analysis.
4. Direct-tension indicators.
5. Tension-control, high-strength bolt-nut-washer assemblies.
6. Shear stud connectors.
7. Deformed bar anchors.
8. Nonshrink grout.
9. Post installed structural anchors: See specification section 050520

G. Shop Drawings: Show fabrication of structural-steel components.

1. All anchor rods shall be detailed with a minimum 3” projection above top of nut in the final installed condition unless noted otherwise.
2. Include min. 1/8” anchor rod setting templates. Detail quantity of templates such that there is one template for each bolt group. (Templates should not be reused).
3. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
4. Splice members where indicated in the contract documents and as required to facilitate fabrication and erection. Coordinate splice locations within the limitations of referenced standards subject to approval of the Engineer of Record.

5. Include embedment drawings showing plan location and elevation of all embedded items.
6. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
7. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
8. Include scale drawings of all gusset plates.
9. Provide minimum 1/4" thick cap plates at the ends of all exposed HSS members, and at the top of all HSS columns.
10. Equally space filler beams or joists between columns and/or other dimensioned beams unless noted otherwise.
11. Where delegated design submittals are required the delegated design submittal must be included with associated shop drawings or the submittal will not be reviewed.

H. Delegated-Design Submittal:

1. Steel to Steel Connections:

a. For structural steel connections indicated to comply with design loads provide structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

1) Coordinate with Engineer of Record loading requirements at all steel to steel connections where not specifically indicated on the contract documents.
2) Coordinate with Engineer of Record for loading requirements at all splice locations
3) Each individual calculation shall be clearly labeled in coordination with erection drawings such that it identifies the member(s) that the connection applies to.

b. Professional Engineer's Statement: A written statement indicating that the for fabrication shop drawings incorporate all the connection requirements included in the calculations submitted for approval inclusive of any corrections required in response to shop drawing review comments. The statement shall be prepared by, and signed and sealed by the professional engineer that completed the calculations submittal.

c. The calculations must be included with the associated shop drawing submittal or the submittal will not be reviewed.

I. Slip Critical Bolt Installation Statement: A written statement indicating the means and equipment to be used to achieve the tightening requirements for clip critical bolt installation. Statement shall identify the specific pre-installation required by the special inspections and acknowledge that this testing must be coordinated and completed prior to commencement of erection.

J. As-built anchor rod and embed survey

K. Welding certificates

1. Submit welding certificates for all individuals expected to be performing field welding

L. Welding Procedure Specifications (WPS's) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each field welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

M. Qualification Data:

1. Fabricator
2. Structural Steel Erector
3. Post Installed Structural Anchor Installer: See specification section 050520

N. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

O. Research/Evaluation Reports:

1. Post Installed Structural Anchors per specification section 050520

P. Material Test Reports

Q. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Quality Control Plan: Each fabricator and Erector shall provide a job specific Quality Control plan.

1. The plan shall specifically identify all QC and QA inspections the fabricator and erector will be completing, the frequency of those inspections and the contractor's personnel and/or contractor's testing agency that will be completing the specific inspections.
2. AISC Code of Standard Practice
3. The plan shall comply with AISC 360 chapter N modified as follows:

   a. 100% UT of CJP groove welds without reduction.

4. The plan shall comply with AWS D1.1

B. Connection Design Engineer

1. Responsibility: Preparation of design calculations for structural steel connections
2. 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.

C. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU (Certified Building Fabricator) and which employs personnel or an independent testing agency that are qualified to complete all the required inspections and testing. Personnel shall be qualified as required by AWS D1.1 where completing weld testing and inspection.

D. Fabricator's Testing Agency (as required to supplement fabricator personnel): An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated. Personnel shall be qualified as required by AWS D1.1 where completing weld testing and inspection.

E. Structural Steel Installer Qualifications: The erector shall be experienced in installing structural steel equal in material, design and scope to the structural steel required for this project.

F. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

G. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

H. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360-16.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

I. Preinstallation Conference: Conduct conference at Project site.

1. Review special inspection and testing and inspecting agency procedures for field quality control.
2. Review items requiring special inspection and testing that must be tested and inspected prior to installation of decking, concrete slabs, or other items that might limit access to the item to be tested or inspected
3. Review welding requirements
4. Review electrode storage requirements
5. Review pre-construction bolt installation verification
6. Review bolt installation calibration requirements

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation. Provide min. 1/8” thick setting template for anchor rods.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes and Tees: ASTM A 992**.**

B. Channels, Angles-Shapes:

1. ASTM A 36 unless noted otherwise
2. ASTM A 572/A 572M, Grade 50 where indicated.

C. Plate and Bar:

1. ASTM A 36 unless noted otherwise
2. ASTM A 572/A 572M, Grade 50 where indicated.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade C, structural tubing.

1. Square or Rectangular HSS: Fy=50 KSI
2. Round HSS: Fy=46 KSI

E. Welding Electrodes:

1. Comply with AWS D1.1 requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM F 3125 GradeA325 or Grade A490 as indicated or as required, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

1. Finish:

a. Unprimed, Primed or painted steel: Plain
b. Hot Dip Galvanized Steel:

1) Bolts

a) Grade A325: ASTM F 2329 Hot-dip zinc coating
b) Grade A490: ASTM F1136 Grade 3 Zinc/Aluminum Coating

2) Nuts: ASTM F2329 Hot-dip zinc coating
3) Washers: ASTM F2329 Hot-dip zinc coating
4) Plate Washers:ASTM A123 Hot-dip zing coating

2. Direct-Tension Indicators (At Contractor's option for Pretensioned or Slip Critical Connections): ASTM F959, Type 325 or Type 490 corresponding to bolt type, compressible-washer type.

a. Finish:

1) Unprimed, Primed or painted steel: Plain
2) Hot Dip Galvanized Steel: Mechanically deposited zinc coating, ASTM B695, Class 50

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125 Grade F1852 or Grade F2280 as indicated or as required, Type 1, heavy hex or round head steel structural bolts with splined ends; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

1. Finish:
    a. Unprimed, Primed or painted steel: Plain
    b. Hot Dip Galvanized Steel: Not permitted.

C. Unheaded Anchor Rods
1. ASTM F1554 of Grade and associated supplements as indicated and as follows:
    a. Grade 36, Supplement S3
    b. Grade 55 with supplements S1 (weldable) and S3
    c. Grade 105 with supplement S3
2. Configuration: Straight.
3. Nuts: ASTM A 563 heavy hex carbon steel.
4. Plate Washers: ASTM A 36 carbon steel UNO, ASTM A 572 Grade 50 where indicated.
5. Washers: ASTM F 436 hardened carbon steel.
6. Finish:
    a. Unprimed, Primed or painted steel: Plain
    b. Hot Dip Galvanized Steel:
        1) Rod: ASTM F 2329 Hot-dip zinc coating
        2) Nuts: ASTM F2329 Hot-dip zinc coating
        3) Washers: ASTM F2329 Hot-dip zinc coating
        4) Plate Washers:ASTM A123 Hot-dip zing coating

D. Thread Studs: ASTM A 108, Grades 1015 through 1020, Full Threaded-stud type, cold-finished carbon steel; AWS D1.1, Type B.

E. Headed Stud Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

F. Deformed Bar Anchors (DBA's): AWS D1.1, Type “C”, ASTM A1064.

G. Threaded Rods: ASTM A 36 unless noted otherwise.
1. Nuts: ASTM A 563 heavy hex carbon steel.
2. Washers: ASTM A 36/A 36M carbon steel.
3. Finish:
    a. Plain for unprimed steel or steel receiving standard shop primer.
    b. Hot-dip zinc coating, ASTM A 153/A 153M, Class C for hot galvanized steel or steel to receive high performance top coating.

H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.
1. Finish:
    a. Plain for unprimed steel or steel receiving standard shop primer.
    b. Hot-dip zinc coating, ASTM A 153/A 153M, Class C for hot galvanized steel or steel to receive high performance top coating.

I. Post Installed Structural Anchors: See specification section 055020 for products

2.3 PRIMER

A. Standard Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

1. Typical all primed steel unless noted otherwise

B. Special Primer: Provide shop primer that complies with Division 09 painting Sections.

2.4 PAINT

A. Galvanizing Repair Paint: ASTM A 780.

2.5 NONSHRINK GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Compressive Strength: Two times the strength of the supporting concrete, but not less than 8000 psi.

2.6 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

F. Deformed Bar Anchors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of deformed bar anchors according to AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

I. BUCKLING RESTRAINED BRACES

1. Splices in steel cores are not permitted
2. Assemble components of the BRB’s in a manner to ensure proper performance of the brace.

2.7 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type:

a. Snug tightened unless noted otherwise

B. Weld Connections:

1. Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.8 CLEANING

A. Clean and prepare faying surfaces in class “B” slip critical connections according to SPSC-SP6 “Commercial Blast Cleaning.”

B. Clean and prepare steel surfaces in class “A” slip critical connections that are to remain unprimed according to SSPC-SP 2, "Hand Tool Cleaning" unless noted otherwise.

C. Clean and prepare steel surfaces that are to remain unprimed according to SSPC-SP 2, "Hand Tool Cleaning" unless noted otherwise.

D. Clean and prepare steel surfaces that are to receive standard primer according to SSPC-SP 3, "Power Tool Cleaning."

E. Clean and prepare steel surfaces that are to receive special primer according to the associated painting specification. When not specifically noted the minimum cleaning shall be SSPC-SP 6, "Commercial Blast Cleaning."

2.9 STANDARD PRIMING

A. Shop prime steel surfaces where indicated by contract drawings.

B. Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

C. Stripe paint corners, crevices, bolts, welds, and sharp edges.

D. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.10 SPECIAL PRIMING:

A. All steel located in exterior spaces shall be shop primed per Division 09 Section "Exterior Painting"

B. All steel located in interior spaces but to remain exposed shall be shop primed per Division 09 Section Interior Painting

2.11 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed to the environment or that will be exposed in the finished work by plugging with zinc solder and filing off smooth.
2. Galvanize loose and hung lintels, shelf angles, all exposed exterior steel and all steel located in exterior masonry walls unless noted otherwise. Coordinate with drawings and specifications.

    a. Galvanized elements to be top coated shall not be quenched, and shall be swept blast to ensure proper adhesion of top coats.

2.12 SOURCE QUALITY CONTROL

A. All source quality control and source quality assurance shall be completed by the fabricator’s qualified personnel and/or the fabricator’s qualified testing agency and shall be in accordance with the submitted and approved job specific quality control manual.

1. Additional weld inspections as noted herein or in the contract documents.
2. Payment for shop testing and inspection shall be the responsibility of the fabricator.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified as-built survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Where ungrouted anchor rod sleeves are required caulk the annular surface between the sleeve and the anchor rod to prevent grout from entering the sleeves.
2. Set plates for structural members on wedges, shims, or setting nuts as required. All shims shall be steel material.
3. Weld plate washers to top of baseplate as indicated.
4. Snug-tighten anchor rods after supported members have been positioned and plumbed.
5. Bearing plates and loose column base plates shall be grouted and cured prior to erecting the steel to be supported by the plate
6. Base plates attached to columns shall be grouted as soon as possible after the column has been plumbed. Base plates shall be grouted and cured before any elevated slabs are cast or before any column splices are made.

7. Prior to grouting all loose and latent material shall be removed from bearing surfaces and base or bearing plates. Concrete or masonry surfaces shall be broom clean. All shims or wedges shall be left in place and cut flush to the edge of the base or bearing plate.
8. Grout shall be placed solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation and curing instructions for shrinkage-resistant grouts.
    a. Use grout forms and grout surcharging as required to ensure that grout completely fills the space below bearing or base plate, and no voids remain.
9. Paint base plates, anchor bolts and sections of columns below grade and below finished floor with Coal Tar Mastic Paint when indicated on drawings.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated on approved shop drawings.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
1. For slip critical connections enlarge hole to next standard hole size and provide next standard bolt size.

I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

J. Shelf Angles anchored to steel frame:
1. Sequencing of shelf angle installation shall be as indicated in drawings
2. Unless noted otherwise do not permanently attach shelf angles until concrete slabs have been poured and cured.
3. Once slabs have been poured and cured coordinate final elevation of shelf angle with contract documents and masonry contractor and permanently fasten.

K. Pour stops and edge angles: Pour stops and edge angles shall be field installed based on global building control lines to ensure overall building geometry is maintained.

1. Do not located based on local member geometry.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: As indicated on shop drawings.

B. Finger Tight Bolts: All joints noted as finger tight shall be hand tightened as required to install elements. Do not tighten by mechanical means

1. Provide jam nuts to prevent nut from backing off.
2. After initial tightening turn nut and jam nut in opposite direction to bind them against one another.

C. Weld Connections:

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
3. Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
4. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

D. Post Installed Structural Anchors: See specification section 050520 for products

3.5 FIELD PAINTING

A. Field painting of structural steel for finished appearance in exposed conditions or for high performance coating systems is specified in Division 09 painting sections.

3.6 FIELD QUALITY CONTROL

A. The erector shall complete Field Quality control in accordance with AISC 360 Chapter N

B. Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

C. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements when the work was deemed deficient upon initial testing or inspection.

3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

1. The coating thickness for zinc-rich paint repairs must be 50% higher than the surrounding coating thickness, but not less than 2.0 mils and not greater than 4.0 mils.
2. The repaired surface should be free of lumps, coarse areas and loose particles

B. Touchup Painting: At all exterior and exposed interior conditions promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
2. Apply a primer of same type as shop primer used on adjacent surfaces. Coordinate with Part 2 priming requirements

END OF SECTION

SECTION 05 12 13 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL

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 architecturally exposed structural-steel framing.

1. Requirements in Division 05 Section "Structural Steel Framing" also apply to AESS framing.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Structural Steel Framing" for additional requirements applicable to AESS.
3. Division 09 painting Sections for intermediate and top coat requirements for shop primed elements.

1.3 DEFINITIONS

A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

B. Feature Elements: All AESS shall be treated as “Feature Elements” (AESS 2 or AESS 3) unless specifically identified as “Basic Elements” (AESS 1) in the contract documents.

C. Category AESS 1: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 1 and/or that is designated AESS 1 or Category AESS 1 in the Contract Documents.

D. Category AESS 2: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 2 and/or that is designated as AESS 2 or Category AESS 2 in the Contract Documents.

E. Category AESS 3: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 3 and/or that is designated as AESS 3 or Category AESS 3in the Contract Documents.

1.4 SUBMITTALS

A. Contractor’s Statement of Responsibility Per Division 01 Section "Quality Requirements"

B. Fabricator’s Certificate of Compliance Per Division 01 Section "Quality Requirements"

C. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.

1. Identify AESS category for each steel member and connection, including transitions between AESS categories and between AESS and non-AESS.
2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
3. Include embedment Drawings.
4. Indicate orientation of mill marks and HSS seams (where permitted).
5. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections. Indicate orientation of bolt heads.
7. Indicate exposed surfaces and edges and surface preparation being used.
8. Indicate special tolerances and erection requirements.
9. Indicate vent holes and filling of vent holes for galvanized HSS.
10. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.

D. Paint compatibility Certificates: From manufacturers of intermediate and topcoats to be applied over shop primers certifying that shop primers are compatible with top coats.

E. Qualification Data:

1. Fabricator
2. Installer

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program, is designated an AISC-Certified Erector, Category CSE and is experienced in installing Architecturally Exposed Structural Steel Framing equal in material, design and scope to that required for this project.

B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU (Certified Building Fabricator) and which employs personnel or an independent testing agency that are qualified to complete all the required inspections and testing. Personnel shall be qualified as required by AWS D1.1 where completing weld testing and inspection..

C. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

D. Preinstallation Conference: Conduct conference at Project site in conjunction with Structural Steel Preinstallation conference.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off

ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.7 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

PART 2 - PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish:

a. Plain for connecting bar or shop primed steel without galvanizing
b. Mechanically deposited zinc coating for connecting galvanized steel

2.1 FILLER

A. Polyester filler intended for use in repairing dents in automobile bodies.

2.2 PRIMER

A. Primer: All products shall be coordinated and compatible with intermediate and top coat products specified in Division 09 painting sections.

B. Etching Cleaner for Galvanized Metal:

1. Coordinate with Division 9 painting sections
2. Complying with MPI#25 where not specifically noted otherwise in Division 9.

C. Galvanizing Repair Paint: ASTM A 780.

D. Shop Primer for Galvanized Steel:

1. Coordinate with Division 9 painting sections

2. Cementitious galvanized metal primer complying with MPI#26 where not specifically indicated otherwise in Division 9

2.3 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.

1. Use special care handling and fabricating AESS before and after shop painting to minimize damage to shop finish.

B. Category AESS 1:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
6. Limit butt and plug weld projections to 1/16 inch.
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.

C. Category AESS 2:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
6. Limit butt and plug weld projections to 1/16 inch.
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.

13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.

D. Category AESS 3:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
6. Limit butt and plug weld projections to 1/16 inch.
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.

E. Curved Members: Fabricate indicated members to curved shape by rolling to final shape in fabrication shop.

1. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of 20 feet under any lighting conditions.
2. Tolerances for walls of hollow steel sections after rolling shall be approximately 1/2 inch.

2.4 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened unless noted otherwise.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.

2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where AESS is exposed to weather.

2.5 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

2.6 SHOP PRIMING

A. Shop prime all Architecturally Exposed Structural Steel including galvanized surfaces except the following:

1. Surfaces to be field welded.
2. Surfaces to be high-strength bolted with slip-critical connections.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Cleaning in first and second subparagraphs below removes loose rust, mill scale, and paint. Cleaning in first subparagraph is minimum surface preparation accepted by AISC for painted steel.

1. Coordinate surface preparation requirements with Division 9 painting sections
2. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning” where not specifically indicated otherwise in Division 9 painting sections.

C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by primer manufacturer to provide a minimum dry film thickness of 1.5 mils Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Priming of Architecturally Exposed Steel shall be done with extreme care to avoid drips and runs.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.
3. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Take special care during erection to avoid marking or distorting the AESS and to minimize damage to shop painting. Set AESS accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360.

1. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Take care to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of temporary elements.
2. Grind tack welds smooth.
3. Remove backing and runoff tabs, and grind welds smooth.
4. Orient bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
5. Remove erection bolts in AESS, fill holes with weld metal or filler, and grind or sand smooth to achieve surface quality approved by Architect.
6. Fill weld access holes in AESS with weld metal or filler and grind, or sand smooth to achieve surface quality as approved by Architect.
7. Conceal fabrication and erection markings from view in the completed structure.

B. In addition to ANSI/AISC 303, Section 10 requirements, comply with the following.

1. Erection of Category AESS 1 and Category AESS 2:

a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
b. Comply with AWS D1.1. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
c. Remove weld spatter, slivers, and similar surface discontinuities.

d. Grind off butt and plug weld projections larger than 1/16 inch.
e. Continuous welds shall be of uniform size and profile.
f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
g. Splice members only where indicated on Drawings.
h. No torch cutting or field fabrication is permitted.

2. Erection of Category AESS 3:

a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
b. Comply with AWS D1.1. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
c. Remove weld spatter, slivers, and similar surface discontinuities.
d. Grind off butt and plug weld projections larger than 1/16 inch.
e. Continuous welds shall be of uniform size and profile.
f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
g. Splice members only where indicated on Drawings.
h. No torch cutting or field fabrication is permitted.
i. Weld profiles, quality, and finish shall be as approved by Architect.
j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened unless noted otherwise
2. Orient bolt heads as indicated on Drawings and in same direction for each connection and to maximum extent possible in same direction for similar connections.

B. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article and general requirements for each category of AESS.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Division 05 Section "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.

B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

3.6 REPAIRS AND PROTECTION

A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Touchup Priming: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION

SECTION 05 40 00 - COLD-FORMED 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. This specification section addresses structural cold-formed elements specifically designed and detailed in the contract documents. These elements do not require delegated design to be completed via the shop drawing process.

B. This Section includes the following:

1. Load Bearing Wall Framing.
2. Floor/Ceiling joist framing.

C. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Post Installed Anchors" for wedge, expansion and adhesive anchors
3. Division 05 Section "Engineered Cold Formed Metal Framing" for performance based cold-formed metal framing elements to be designed by the contractor's engineer via the shop drawing submittal process.
4. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, non-structural, metal-stud framing and ceiling-suspension assemblies.
5. Division 06 Section "Sheathing" for sheathing of cold formed walls and roofs other than sheet steel sheathing.
6. Division 05 Section "Post Installed Structural Anchors" for wedge, and adhesive anchors

1.3 SUBMITTALS

A. Product Data:

1. Bridging
2. Punched Studs, Rafters and Joists
3. Unpunched Joists
4. Tracks
5. Shims
6. Miscellaneous structural clips and accessories
7. Post installed structural anchors: See specification section 050520

B. Contractor’s Statement of Responsibility Per Division 01 Section "Quality Requirements"

C. Research/Evaluation Reports:

1. For cold-formed metal framing in fire resistance assemblies submit reports per the assembly specification
2. Submit ICC reports for the following:
    a. Mechanical fasteners
    b. Post installed structural anchors: See specification section 050520

D. Substitutions:

1. Substitution requests may only be made using products with ICC-ESR reports specific to the product application shown in the contract documents.
2. Any increase in material or labor cost resulting from the substitution shall be the responsibility of the contractor.

E. Qualification Data:

1. Post Installed Structural Anchor Installer per specification section 050520

1.4 QUALITY ASSURANCE

A. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

B. Installer Qualifications: The installer shall be experienced in installing cold formed steel equal in material, design and scope to that required for this project.

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" including 2004 supplement and its "Standard for Cold-Formed Steel Framing - General Provisions."

E. Section Properties: All section properties are shall conform to The Steel Stud Manufacturer's Association's, "Product Technical Information", 2001, ICBO ER-494P.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Review special inspection and testing and inspecting agency procedures for field quality control.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

C. Store cold-formed metal framing on supports off the ground

D. Keep cold-formed metal framing fee of dirt and foreign matter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. ClarkDietrich
2. MarinoWare
3. The Steel Network

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade:

a. ST33H for 30, 33, and 43 mil products unless noted otherwise.
b. ST50H for 54,68, and 97 mil product unless noted otherwise.

2. Coating: G60.

B. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50, Class 1 or 2.
2. Coating: G60 or better.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated, but not less than 43 mils.
2. Flange Width: As indicated, but not less than 1-5/8 inches.

B. Steel Track:

1. Tracks: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

a. Minimum Base-Metal Thickness: As indicated, but not less than 43 mils.
b. Flange Width: As indicated, but not less than 1-1/2 inches.

C. Steel Box Headers: Manufacturer's standard C-shapes used to form header beams in a boxed configuration, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated, but not less than 43 mils.
2. Flange Width: As indicated, but not less than 1-1/2 inches.

2.4 FLOOR/CEILING JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated, but not less than 43 mils.
2. Flange Width: As indicated, but not less than 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: As indicated, but not less than 43 mils.
2. Flange Width: As indicated, but not less than 1-1/2 inches.

C. Built-up Members: Built-up members of manufacturer's standard C-shaped steel section, with stiffened flanges, nested into a U-shaped steel section joist track, with unstiffened flanges; unpunched; of web depths indicated; and as follows:

1. Minimum Base-Metal Thickness: As indicated, but not less than 43 mils.
2. Flange Width: As indicated, but not less than 1-5/8 inches.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, grade and coating as follows:

1. Grade:

a. ST33H for 30, 33, and 43 mil products unless noted otherwise.
b. ST50H for 54,68, and 97 mil product unless noted otherwise.

2. Coating: G60.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Bracing, bridging, and solid blocking.
2. Anchor clips.
3. Foundation clips.
4. Gusset plates: minimum 54 mils unless specifically noted otherwise.
5. Joist hangers and end closures.
6. Hole reinforcing plates.
7. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C. Acceptable bolt configuration as follows:

1. Hex-headed bolts
2. Headless bolts, with encased end threaded

a. Tack welded nut on threaded end at specified embedment depth
b. Alternately, provide a nut at specified embedment depth and jam nut below the nut at specified embedment depth

C. Post installed structural anchors: See specification section 050520

D. Power-Actuated Anchors: Basis of design product as indicated on drawings. See requirements for substitution submittals. Where not specifically indicate the basis of design fasteners shall be Hilti X-U fasteners in accordance with ICC ESR-2269.

1. Diameter: 0.157” unless noted otherwise
2. Concrete Embedment: 1 ½ inches unless noted otherwise
3. Steel Embedment: The lesser of ½ inch or the tip fully penetrating base metal.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.8 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

E. Cut framing members by sawing or shearing; do not torch cut.

F. All joist studs, joists, and rafters shall be cut such that the extreme edge of web openings are a minimum of 10 inches away from member ends, bearing points, or attachments of other structure.

G. Post installed structural anchors: See specification section 050520

H. Fasten cold-formed metal framing members as noted in the drawings. Where not specifically indicated fasten by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

1. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2. Locate mechanical fasteners and install according to drawings, and the following requirements:
    a. Minimum edge distance and center to center spacing of fasteners shall be three fastener diameters unless noted otherwise.
    b. Minimum screw penetration shall leave at least 3 exposed threads on the backside of connection unless noted otherwise.

I. Install framing members in one-piece lengths unless splice connections are indicated. Provide tracks and structural fascia track in longest lengths practical. Splice per typical details.

1. Do not splice diagonal strap bracing unless specifically indicated.

J. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

K. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

L. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

M. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

A. All studs shall be cut such that the extreme edge of web openings are a minimum of 10 inches away from member ends, bearing points and attachment of other structure.

B. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As indicated

C. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track.

1. Note requirement for custom tracks in specific instances as noted in part 2

D. Fasten both flanges of studs to top and bottom tracks as indicated.

E. Space studs as follows:

1. Stud Spacing: As indicated, 16" where not specifically indicated.

F. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

G. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

H. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

I. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

J. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

K. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

L. Install horizontal bridging in stud system, spaced as indicated. Where not specifically indicated provide at 48" O.C. max. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
    a. Framer shall be responsible for ensuring main member punchouts are aligned to receive continuous line of bridging.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
    a. Flat straps shall be a minimum of 1 1/2 inches wide and 33 mils thick unless noted otherwise.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

M. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FLOOR AND CEILING JOIST INSTALLATION

A. All joists shall be cut such that the extreme edge of web openings are a minimum of 10 inches away from member ends, bearing points and attachment of other structure.

B. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on drawings.

C. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
1. Install joists over supporting frame with a minimum end bearing as indicated. Bear full width of supporting element where not noted otherwise
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated.

D. Space joists directly adjacent to abutting walls, and as follows:
1. Joist Spacing: As indicated, 16" where not specifically indicated

E. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

F. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on drawings.
1. Install web stiffeners to transfer axial loads of walls above.

G. Install bridging at intervals indicated on drawings, but not more than 48 inches on center.. Fasten bridging at each joist intersection as follows:
1. Bridging: As indicated on drawings. Where not specifically indicated provide combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match joist.

a. Provide straps on each face of joists and fasten to each stud flange with (1)-#10 screws.
b. Only splice straps at solid blocking.
c. Fasten strap to solid blocking with (8)-#10 screws. At splices fasten all screws through both plies of splice.
d. Provide solid blocking at centers not exceeding 96 inches.
e. Securely fasten solid blocking to joist webs using 54 mil clips and (4)-#10 screws from blocking to clip and clip to stud web.

H. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

I. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 054100 - ENGINEERED COLD-FORMED 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. This specification section addresses structural cold-formed elements which are not specifically designed and detailed in the contract documents, with the exception of engineered fabricated cold formed metal trusses. These elements require delegated design to be completed via the shop drawing process.

B. This Section includes the following:

1. Exterior non-load-bearing wall framing.
2. Exterior wall furring

C. Related Sections include the following:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Cold Formed Metal Framing" for cold-formed metal framing elements specifically designed and detailed in the contract documents.
3. Division 05 Section "Post Installed Structural Anchors" for wedge, and adhesive anchors
4. Division 06 Section "Sheathing" for sheathing of cold formed walls and roofs
5. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
6. Division 07 Section "Thermal Insulation," for insulating built up exterior wall members

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As follows:

a. Dead Loads: Weights of attached and supported sheathing and Cladding
b. Live Loads: As indicated
c. Snow Loads: Compute using structural design criteria given**.**
d. Wind Loads:

1) Use components and cladding pressures given based on element location, and tributary area. Effective wind area as defined by ASCE 7 may be use to determine appropriate pressure.
2) Where components and cladding pressure are not given calculate them based on structural design criteria given.

3) Components and cladding pressures can be multiplied by a factor of 0.42 for

deflection checks.

e. Seismic Loads: Compute Seismic load factors to determine horizontal and vertical seismic forces using structural design criteria given**.**

2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing

1) Horizontal deflection of 1/360 of the wall height when acting as backup for masonry:
2) Horizontal deflection of 1/360 of the wall height when acting as backup for other than masonry.

b. Exterior Wall Furring

1) Horizontal deflection of 1/360 of the wall height when acting as backup for masonry:
2) Horizontal deflection of 1/360 of the wall height when acting as backup for other than masonry.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

a. Upward and downward movement of 3/4" inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

A. Product Data:

1. Electrodes
2. Galvanizing Repair Paint
3. Bracing
4. Bridging
5. Studs and Joists
6. Tracks
7. Miscellaneous structural clips and accessories
8. Furring
9. Post installed structural anchors: See specification section 050520

B. Contractor’s Statement of Responsibility Per Division 01 Section "Quality Requirements"

C. Shop Drawings:

1. Provide shop drawings for all items included in this spec section
2. Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. Wall framing shall include plans and/or elevations with sections cut to indicate construction of all various wall types. Details shall be provided for all head, sill, jamb, bottom track, top track and all special conditions.
4. Coordinate special stud layouts, posts, structural blocking or other structural components for support and attachment of miscellaneous items including but not limited to ladders, canopies, signage and supported equipment.
5. Indicate specific post installed structural anchors, mechanical fasteners, and powder actuated fastener products to be used during installation.

D. Delegated-Design Submittal:

1. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Indicate specific post installed structural anchors, mechanical fasteners and powder actuated fasteners used in calculations and to be used during installation.

E. Welding certificates.

1. Submit welding certificates for all individuals expected to be performing field welding

F. Welding Procedure Specifications (WPS's) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code -Steel" and AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

G. Research/Evaluation Reports:

1. For cold-formed metal framing in fire resistance assemblies submit reports per the assembly specification
2. Submit ICC reports for the following:
    a. Vertical deflection clips
    b. Horizontal drift deflection clips
    c. Mechanical fasteners
    d. Powder actuated fasteners
    e. Single Deflection Track
    f. Post installed structural anchors: See specification section 050520.

H. Qualification Data:

1. Post Installed Structural Anchor Installer per specification section 050520
2. Powder Actuated Fastener Installer: Submit installer qualification data as stated in Quality Assurance section. Qualifications shall be submitted in a letter format for each type of anchor to be installed, and shall include the following.
    a. The specific product to be used
    b. Complete description of installation procedure
    c. Manufacturer’s training certificates

1.5 QUALITY ASSURANCE

A. Post Installed Structural Anchor Installer: See specification section 050520 for requirements

B. Powder Actuated Fastener Installer: All installers shall be experienced in installing anchors equal to type and into the substrate material required for the project. All installers shall have a manufacturer's training certificate.

C. Installer Qualifications: The installer shall be experienced in installing cold formed steel equal in material, design and scope to that required for this project.

D. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

F. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

G. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

H. AISI Specifications and Standards:

1. Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

I. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Review special inspection and testing and inspecting agency procedures for field quality control.
2. Review Powder Actuated Fastener Installer requirements

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

C. Store cold-formed metal framing on supports off the ground

D. Keep cold-formed metal framing fee of dirt and foreign matter.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60

B. Steel Sheet for Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating

1. Grade: As required by structural performance.
2. Coating: G60.

2.2 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required for structural performance, but not less than 43 mils.
2. Flange Width: As required for structural performance, but not less than 1-5/8 inches.
3. Section Properties: As required for structural performance**.**

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, un-punched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required for structural performance, but not less than 43 mils.
2. Flange Width: As required for structural performance, but not less than 1-1/2 inches.
3. Section Properties: As required for structural performance**.**

C. Steel Box Headers: Manufacturer's standard C-shapes used to form header beams in a boxed configuration, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: As required for structural performance, but not less than 43 mils.
2. Flange Width: As required for structural performance, but not less than 1-5/8 inches
3. Section Properties: As required for structural performance**.**

D. Vertical Deflection Clips: Manufacturer's standard bypass or head clips as required by detailing conditions, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

E. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: Minimum Base-Metal Thickness: As required for structural performance, but not less than 43 mils.
2. Flange Width: 1 inch plus twice the design gap.
3. Flanges: Provide flanges with slotted holes at regular intervals to allow for positive attachment of studs while allowing for vertical movement up to the design gap dimension.

4. Webs: Provide webs with slotted holes at regular intervals to allow for positive attachment of track to structure while allowing for horizontal movement where required based on interstory drift criteria.

F. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

1. Outer Track: Of web depth to allow free vertical movement of inner track, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

a. Minimum Base-Metal Thickness: As required for structural performance, but not less than 43 mils.
b. Flange Width: plus twice the design gap.

2. Inner Track: Of web depth indicated, and as follows:

a. Minimum Base-Metal Thickness: As required for structural performance, but not less than 43 mils
b. Flange Width: Insert dimension equal to sum of outer deflection track flange width plus 1 inch

G. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure as required by interstory drift criteria.

2.3 EXTERIOR WALL FURRING

A. Z-shaped sections: Manufacturer's standard C or Z-furring as follows:

1. Minimum Base-Metal Thickness: As required for structural performance but not less than 43 mils.
2. With Slotted or non-slotted web,
3. Face flange: 1-1/4 inches minimum but not less than required by finish wall system
4. Wall attachment flange: 7/8 inch minimum
5. Depth: As required for wall system specified on drawings

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Joist hangers and end closures.

9. Hole reinforcing plates.
10. Backer plates.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Post installed structural anchors: See specification section 050520.

C. Powder-Actuated Fasteners: Fastener system specifically indicated on approved shop drawings and calculations of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure the required loads as determined by testing per ASTM E 1190 and ICC AC70 conducted by a qualified independent testing agency, and documented in an ICC ESR report applicable for the specific substrate being anchored into.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

C. Shims: Load bearing, high-density multi-monomer plastic, non-leaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening; clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

E. Cut framing members by sawing or shearing; do not torch cut.

F. Post installed structural anchors: See specification section 050520.

G. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

1. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

H. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

I. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

J. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

K. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

L. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

M. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten flanges of studs as indicated on shop drawings.

C. Space studs as follows:

1. Stud Spacing: As indicated, but not more than 16 inches.

D. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

E. Isolate non-load-bearing steel framing from building structure per shop drawings to prevent transfer of vertical loads while providing lateral support.

F. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 EXTERIOR FURRING INSTALLATION

A. Install, anchor, bridge, and brace furring according to Shop Drawings and requirements in this Section.

B. Furring Spacing: Coordinate furring spacing with finished wall material shop drawings.

C. Install vertical sag bridging as required by shop drawings.

D. Fasten furring to backup wall system as indicated on shop drawings.

3.6 FIELD QUALITY CONTROL

A. Testing and Inspection: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports in accordance with the schedule of special inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 055133 - METAL LADDERS

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. Retractable Aluminum Ship Ladder with Handrail

B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete".
   2. Section 054100 "Engineered Cold Formed Metal Framing".
   3. Section 092900 “Gypsum Board”.

1.3 REFERENCES:

A. American National Standards Institute (ANSI):
   1. ANSI A14.3 - Ladders, Fixed, Safety Requirements.

B. American Society for Testing and Materials (ASTM) Publications:
   1. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
   2. ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

C. Occupational Safety and Health Administration (OSHA):
   1. OHSA 1910.23 - Fixed Ladders
   2. OSHA 1910.28 – Duty to have fall protection and falling object protection.

1.4 ACTION SUBMITTALS

A. Product Data: For access ladders and accessories.
   1. Manufacturer’s data sheets on each product to be used.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Typical installation methods.

B. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer’s qualifications: Evidence of experience manufacturing similar ladders for a minimum of 5 years.

B. Welding certificates: Documentation showing welders are certified in accordance with AWS D1.2/D1.2M standards, Structural Welding Code - Aluminum.

C. Certifications that ladders meet applicable OSHA and local building code requirements.

D. Mill certificates for metal materials verifying compliance with specified grades.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of five (5) years documented experience.

B. Installer Qualifications: Company specializing in performing Work of this section with minimum two (2) years documented experience with projects of similar scope and complexity.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store and handle in strict compliance with manufacturer's written instructions and recommendations.

B. Protect from damage due to weather, excessive temperature, and construction operations.

1.9 WARRANTY

A. limited warranty of minimum five (5) years

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Model MP70 by ALACO Ladder Co. Or comparable product by one of the following:
1. UPNOVR, Inc.
2. Global Equipment Company Inc.

2.2 RETRACTABLE ALUMINUM SHIP LADDER WITH HANDRAIL

A. Type: Retractable, Wall Mounted.

B. Material:
1. Extruded Aluminum: ASTM B221, Alloy 6061 Temper T-6, non-spark.
2. Sheet Aluminum: ASTM B209 6061 Temper T-6.
3. Finish: Mill finished aluminum, no paint.

C. Loading Capacity: 500 pounds, minimum.

D. Width: 24 inches (610 mm) width, minimum.

E. Accommodation Height: 14 feet (4267 mm) height.

F. Angle of Inclination: 70 degrees.

G. Rungs:
1. Size: 4 inches (102 mm) depth, minimum, by 24 inches (610 mm) depth.
2. Rungs Spacing: 12 inches (305 mm) maximum on centers.

3. Surface: Nonslip surface - Corrugated surface or abrasive material metallically bonded to rung.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

H. Handrail:
1. 1-1/4 inches (32 mm) diameter round serrated aluminum tubing with cast aluminum fittings.
2. Form returns with 6 inches (152 mm) radius.
3. Attach rail to rails with pipe sections spaced evenly at no more than 48 inches (1219 mm) such that rail projects approximately 6 inches (152 mm) above stringer.
4. Handrail to extend above top tread a minimum of 42 inches (1067 mm).

I. Operating Mechanism: **Pivoting hinged counterbalanced mechanism** attached to support structure with brackets as detailed on approved shop drawings.

2.3 ACCESSORIES:

A. Wall Mounting Brackets and Bolts: Support ladders at top, comply with ladder manufacturer's written instructions and recommendations.

B. Non-marking solid rubber feet:
1. Extend 3/4 inch (19.1 mm) from the siderails' ends, refer also to architectural drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until the substrates have been properly constructed and prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Prior to fabrication, field verify required dimensions.

D. Coordinate Ladder Installation with Construction of:

E. Metal stud walls specified in Section 05 41 00 – Engineered Cold-Formed Metal Framing
1. Ensure adequate support and blocking for attachment of brackets and support of ladder.

F. Insulate dissimilar metals to prevent electrolysis with bituminous paint or non-absorptive isolation pad to prevent contact.

3.2 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

B. Confirm loads and provide adequate support. Attachment to metal stud framing must be verified, provide proper block / support for proper installation.

3.3 FIELD QUALITY CONTROL:

A. After Installation Ladder Inspection: Verify proper, secure, and safe installation.

3.4 CLEANING AND PROTECTION:

A. Clean products in accordance with the manufacturers' recommendations.

1. Clean ladder using clean water and mild detergent. Do not use abrasive agent, steel wool, or harsh chemicals. Rinse with clean water.
2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 05 51 33

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Wood blocking and nailers.
2. Wood sleepers.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Timber: Lumber of 5 inches nominal or greater in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. SPIB: The Southern Pine Inspection Bureau.
4. WCLIB: West Coast Lumber Inspection Bureau.
5. WWPA: Western Wood Products Association.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA C2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood) and the International Building Code.

1. Use Exterior type for exterior locations and where indicated.
2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.
3. Use Interior Type A, unless otherwise indicated.

B. Application: Treat all rough carpentry, unless otherwise indicated. Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide Construction or No. 2, Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, fire retardant treated, or in area of high relative humidity, provide fasteners, including bolts and anchor bolts, with hot-dip zinc coating complying with ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions.

D. Do not splice structural members between supports, unless otherwise indicated.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

I. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION 06 10 00

SECTION 066400 - PLASTIC PANELING

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. Solid Surface:
   a. Wall Covering

B. Related Requirements:

1. Plumbing Fixtures

1.3 DEFINITION:

A. Solid Surface: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, Indicate product description, fabrication information and compliance with specified performance requirements.

B. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions, locations and size of cutouts, and coordination requirements with adjacent work.

C. Samples:

1. Solid Surface, 6 inches (152 mm) by 6 inches (152 mm), for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer / fabricator.

B. Product Certificates: For each type of product, provide certificate signed by the Installer / fabricator certifying that the work complies with the quality standards, grades and other requirements as referenced and specified herein.

1.6 QUALITY ASSURANCE

A. Installers: Provide work of this Section executed by competent installers with minimum 5 years experience in the application of Products, systems and assemblies specified and with approval and training of the Product manufacturers.

B. Allowable tolerances:
1. Variation in component size: 1/8" (3 mm).
2. Location of openings: 1/8" (3 mm) from indicated location.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver no components to Project site until areas are ready for installation.

B. Storage and Handling Requirements:

1. Store components indoors prior to installation.
2. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that cabinets can be supported and installed as indicated.

B. Electronic Equipment: Coordinate with Owner and equipment supplier the exact sizes required, clearances, ventilation, wiring space, support and attachment for equipment to be installed in casework. Show all such equipment and accommodations on the shop drawings submitted to the Architect.

1.10 WARRANTY

A. Manufacturer Warranty: Provide manufacturer's standard warranty for material only for period of **10 years** against defects and/or deficiencies in accordance with General Conditions of the Contract. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Architect and at no expense to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Corian by DuPont, or comparable product from following manufacturers:
1. Samsung Chemical USA.
2. Wilxonart Contract.

2.2 SOLID SURFACE, GENERAL

A. Material: Homogeneous filled acrylic; not coated, laminated or of composite construction; meeting ANSI Z124.3 & .6, Type Six, and Fed. Spec. WW-P-541E/GEN.

1. Superficial damage to a depth of 0.010" (,25 mm) shall be repairable by sanding.
2. Material shall have minimum physical and performance properties as follows:
   a. Tensile Strength: ASTM D 638, 5000 psi min.
   b. Flexural Strength: ASTM D 739, 7000 psi min.
   c. Hardness: ASTM D 785, 90 Rockwell “M” Scale min., 52 Barcol Impressor min.
   d. Color Stability: NEMA LD 3-3.10, No Change – 200 hrs min.
   e. Wear and Cleanability: ANSI Z 124.3, Passes.
   f. Impact Resistance:
      1) ASTM D 256 Method A, 0.24 ft. lbs/in. of notch min.
      2) ASTM D 3029, 9.0 ft. lbs min.
   g. Stain Resistance: ANSI Z124.3, Passes.
   h. Fungi and Bacteria: ASTM G 21, G22, No Attack
   i. Flammability: ASTM E84, max. 25 and 30 of flame spread and smoke developed, Class 1 and A when tested to UL723.

2.3 WALL COVERING

A. Solid Surface Sheet – Vertical Application shall comply with the following:

1. Thickness: 1/4” (6.4 mm)
2. Edge Treatment:
   a. **Hardseam** @ outside corners
   b. Color-coordinated silicone filled corner where solid surface intersects other materials.
3. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   a. Color “Artista Mist” by Corian, and as selected by Architect from manufacturer's full range of colors and finishes
4. Cutouts in solid surface should be done in the shop. “Partial cutout” is acceptable. Refer to Architectural, plumbing and mechanical drawings for cutouts’ locations for plumbing fixtures and floor sweep.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Adhesives: Do not use adhesives that contain urea formaldehyde. Comply with solid surface’s manufacturer's published instructions and recommendations.

2.5 FABRICATION

A. Examine all conditions and verify all dimensions at the project site. Fabrication and/or installation of the casework and related elements constitutes acceptance of the existing conditions.

B. Not all details of solid surface coverings are shown on the Drawings. The fabricator is to utilize the most advantageous manufacturing process to achieve the quality of casework indicated herein by the referenced AWI Quality Standards and the details shown on the Drawings.

C. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verification of Conditions:

1. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected. Beforeinstallation, condition cabinets to average prevailing humidity conditions in installation areas.
2. Verify actual site dimensions and location of adjacent materials prior to commencing work.
3. Notify Architect in writing of any conditions which would be detrimental to installation.

B. Evaluation and Assessment: Commencement of work implies acceptance of previously completed work.

3.2 INSTALLATION

A. Install components plumb, level, rigid, scribed to adjacent finishes in accordance with reviewed Shop Drawings and Product installation details.

B. Fabricate field joints using manufacturer's recommended adhesive, with joints being inconspicuous in finished work. Exposed joints/seams are not permitted. Keep components and hands clean when making

C. Route solid surface sheets to template. Anchor securely to base component or other supports. Align adjacent components and form seams to comply with manufacturer’s written recommendations using adhesive in color to match work. Carefully dress joints smooth, remove surface scratches and clean entire surface.

D. Install solid surface sheets with no more than 1/8" sag, bow or other variation from a straight line.

E. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

F. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

G. Install decorative protection panels in accordance with manufacturer’s installation instructions, approved submittals.

1. Provide templates and rough-in measurements.

2. Accessory Materials: Install in accordance with manufacturer's written installation instructions.

3.3 ADJUSTING AND CLEANING

A. Protection: Advise Contractor of procedures and precautions for protection of materials, installed casework, and finishes from damage by the Work of other trades until acceptance of the Work by the Owner. Advise Contractor of the required temperature/humidity conditions which must be maintained during the remainder of the construction period in areas of casework installation.

B. Repair damaged and defective solid surface sheets, where possible, to eliminate functional and visual defects; where not possible to repair, replace solid surface sheets. Adjust joinery for uniform appearance.

C. Clean, lubricate, and adjust fixtures.

D. Clean exposed and semi-exposed surfaces.

END OF SECTION 06 64 00

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 REFERENCES

A. IECC 2009 – International Energy Conservation Code 2009

1.3 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
   a. XPS
2. Cellular Glass Structural Insulation.
3. Glass-fiber blanket insulation.
   a. Unfaced Insulation
   b. Sound Attenuation
4. Roof insulation is excluded, refer to Section 074113 for roof insulation system.
5. Related Sections:
   a. Section 07 27 26 Fluid-Applied Membrane Air Barrier.
   b. Section 07 42 13 Metal Wall Panels.
   c. Section 07 62 00 Flashing and Sheet Metal.
   d. Section 07 92 00 Joint Sealants.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene (XPS) Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide DuPont Styrofoam Brand Cavitymate or compatible products by one of the following:
   a. Owens Corning.
   b. Pactiv Corporation.
2. Type IV, 25 psi (173 kPa).
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Water Absorption: ASTM C272, 0.1% max. by volume.

D. Panel Edges: Square

E. Panel Size: 48” wide by 96” long, refer also to the Architectural Drawings for required R value and thickness.

2.2 CELLULAR GLASS STRUCTURAL INSULATION

A. Manufacturers: Subject to compliance with requirements, provide PERINSUL HL by Owens Corning FOAMGLAS or compatible products by one of the following:

1. Tianjin Huali Thermal Insulation.
2. Zhenshen Insulation.

B. Adhesive for Bonding Insulation: FOAMGLAS adhesive, or product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

C. Design Criteria:

1. Type V per ASTM C1902 certified by independent third-party testing agency.
2. Compressive Strength: 304 psi, minimum per ASTM D1621.
3. Thermal Resistance (measured per ASTM C518 at mean temperature of 75˚F): R-2.8 per inch of thickness in horizontal direction and R-2.4 per inch of thickness in vertical direction, with 100% lifetime limited warranty on thermal resistance.
4. Water Absorption (ASTM C272): 0.001% max. by volume.
5. Surface Burning Characteristics (ASTM E84): Flame spread less than 25; smoke developed less than 450, certified by independent third-party testing agency.

D. Materials:

1. Contains no HCFCs or HFC 134a blowing agents.
2. Size:
   a. Height: 2 inches min., 4 inches max., refer also to Architectural Drawings.
   b. Depth: Match the adjacent XPS board insulation, refer also to Architectural Drawings.
   c. Length: Full length of the product by the manufacturer.
3. Panel Edge: Square.

2.3 GLASS-FIBER BLANKET INSULATION

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. Owens Corning.
2. Thermal Design, Inc.
3. CertainTeed Corporation.

B. **Unfaced**, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. Insulation shall contain no added formaldehyde

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 SOUND ATTENUATION

A. Interior: Sound Attenuation Blanket, unfaced batt insulation complying with ASTM C665, Type 1 and with governing code for intended application. Insulation shall contain no added formaldehyde. Use thickness indicated on the drawings.

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

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. AGM Industries, Inc.
   b. Gemco.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.762 mm) thick by 2 inches (50 mm) square.

3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch (2.67 mm) in diameter; length to suit depth of insulation indicated.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches (38 mm) square or in diameter.

1. 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. AGM Industries, Inc.
   b. Gemco.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

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. FOAMGLAS
   b. AGM Industries, Inc.
   c. Gemco.

D. Insulation Retaining Wires: Products with demonstrated capability of hold insulation products securely within large cavities, such as those locations where the metal stud cavity is deeper than the insulation thickness.

1. Locate insulation on the exterior side of the cavity and install retaining wires that prevent the insulation from sagging inside the cavity.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR METAL FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. **Foam-Plastic Board Insulation**: Install over exterior sheathing in strict accordance with manufacturer's recommendations and written instructions, including the following:

1. Install rigid insulation directly to exterior grade sheathing at 16 inches (406 mm) on center in the field, vertically and horizontally, and 12 inches on center at perimeter of wall, with manufacturer recommended mechanical fasteners.
2. Install boards horizontally lengthwise on walls, staggering the joints.
3. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
   a. Seal around penetrations using Penetration and Gap Filler material.
   b. Maintain continuity of air barrier by sealing the roof/wall juncture with Roof/Wall Juncture Sealing material.
4. Seal board joints with Manufacturer's recommended sealant product, consistent with ASTM E2357 tested assembly.

C. **Cellular Glass Structural Insulation:** Install along the perimeter of exterior wall base in strict accordance with manufacturer's recommendations and written instructions, including the following:

1. Verify manufacturer recommended cure time for air barrier system and waterproofing before installing structural insulating block.
2. Install a single layer of cellular glass structural insulation directly to exterior grade sheating, with manufacturer's recommended adhesive.
3. Provide continuous sealant and backer rod on top and bottom to seal the gaps. Refer also to architectural drawings.
4. Install cellular glass structural insulation maximum sizes to minimize joints.
5. Butt Joints of cellular glass structural insulating block with no gaps or mortar between joints
6. Insulation board edges shall be butted together tightly and fit around openings and penetrations. Install square edges to fit square and tight.
7. Extend insulation in single course to cover entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation.

D. **Glass-Fiber Blanket Insulation**: Install in cavities formed by framing members according to the following requirements:

1. Use insulation **widths** as indicated in the architectural drawings and **lengths** that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   a. For cavities that are not filled, support batts to flanges of metal studs.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Locate insulation **on the exterior side** of the cavity and install retaining wires that prevent the insulation from sagging inside the cavity.
4. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically to flanges of metal studs.

E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

3.4 INSTALLATION OF INSULATION FOR SOUND ATTENUATION

A. Where sound attenuation blankets are indicated for sound attenuation within walls, install in cavities formed by framing members according to the following requirements:

1. Use insulation **widths and lengths** that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

B. Where wall framing and g.w.b. and/or sheathing extends to roof / ceiling deck above and sound attenuation is indicated, continue sound attenuation to the deck above.

C. Where wall framing and g.w.b. and/or sheathing terminates above ceiling, and sound attenuation is indicated, provide sound attenuation on ceiling surface for 4’-0” each side of wall framing.

3.5 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 26 13 – UNDER SLAB VAPOR RETARDER

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. Products furnished under this section, and installed in coordination with related sections include the following:
   1. Vapor Retarder, seam tape, vapor proofing mastic, pipe boots, detail strip for installation under concrete slabs.
   2. Refer to Section 033000 “Cast-In-Place Concrete” for capillary barriers.

B. Related Sections:
   1. Division 03 Section "Cast-In-Place Concrete" for concrete floor slabs.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Material Certificates: For each product, signed by manufacturers.

C. Samples for verification: (2) - 6” x 6” samples of plastic vapor retarder, seamed together along one side using manufacturer’s seam tape, to form a single 6” x 12” sample.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain primary materials and accessories through one source from a single manufacturer.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit vapor retarder to be installed according to manufacturers' written instructions.

PART 2 - PRODUCTS

2.1 PLASTIC VAPOR RETARDER

A. Basis-of-Design Product: Subject to compliance with requirements, furnish and install products by W.R. Meadows, or comparable products meeting performance requirements and properties by other manufacturers:
   1. Stego Industries, LLC
   2. Insulation Solutions, Inc.

B. Vapor retarder membrane that meets or exceeds the following properties:

   1. Permeance rating: ASTM E 96 or ASTM F 1249, meets permeance requirements for both new material, and after ASTM E-1745 mandatory conditioning tests (ASTM E 154; Sections 8, 11, 12, 13): Comply with ACI 302.1R
      a. New material: Less than 0.01 perms (gr/ft^2/hr/in-Hg).

b. After conditioning: Less than 0.01 perms (gr/ft^2/hr/in-Hg).
2. Water Vapor Retarder: ASTM E 1745, Class A
3. Minimum thickness : 15 mils
4. Manufactured from prime virgin resins.
5. Woven materials are not acceptable.

2.2 MISCELLANEOUS MATERIALS

A. Provide all Miscellaneous materials from the same source as the vapor retarder membrane manufacturer / supplier. Confirm compatibility.

B. Seam Tape: ASTM E 96, Water Vapor Transmission Rate 0.3 perms or lower. Tape all seams, joints and penetrations.

C. Vapor Proofing mastic: ASTM E 96, Water Vapor Transmission Rate 0.3 perms or lower.

D. Pipe boots: Construct pipe boots from vapor retarder material, pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine slab base course, with Installer present, for compliance with requirements for surface stability and other conditions affecting performance of work.

1. Proceed with vapor retarder installation only after base course construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Coordinate installation of the under-slab vapor retarder in conjunction with the drawings and with the work specified in Division 3, Section 03 30 00 "Cast-In-Place Concrete".

B. Comply with manufacturer's written recommendations and ASTM E 1643-98 (2005), unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of vapor retarder.

1. Unroll vapor retarder with the longest dimension parallel in the direction of the concrete pour.
2. Lap vapor retarder over footings or seal to foundation walls.
3. Overlap joints 6 inches and seal with manufacturer's tape.
4. Seal all penetrations (including pipes) per manufacturer's instructions.
5. Do not penetrate the vapor retarder except where necessary for reinforcing steel and permanent utilities.
6. Repair damaged areas by cutting patches of vapor retarder, overlapping damaged area 6-inches, and taping all four sides with seam tape.

END OF SECTION 07 26 13

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

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. Vapor-permeable, fluid-applied air barriers.

B. Related Requirements:

   1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.

1. Build integrated mockups of exterior wall assembly, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
1. Coordinate Fluid Applied Membrane Air Barrier with EIFS system to provide a continuous system over sheathing at EFS system and Brick Veneer.

2.2 PERFORMANCE REQUIREMENTS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft. (0.2 L/s x sq. m of surface area at 75 Pa), when tested according to ASTM E 2357.

2.3 MEDIUM-BUILD AIR BARRIERS, VAPOR PERMEABLE

A. Medium-Build, Vapor-Permeable Air Barrier: Synthetic polymer material with an installed dry film thickness, according to manufacturer's written instructions, of 17 to 30 mils (0.4 to 0.8 mm) over smooth, void-free substrates.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sto Corp. – Sto Gold (basis of design)
   b. DuPont Safety & Construction.
   c. Hohmann & Barnard, Inc.
   d. W.R. Meadows, Inc.

2. Physical and Performance Properties:

   a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
   b. Vapor Permeance: Minimum 10 perms (580 ng/Pa x s x sq. m); ASTM E 96/E 96M, Desiccant Method, Procedure A.
   c. Ultimate Elongation: Minimum 250 percent; ASTM D 412, Die C.

d. Adhesion to Substrate: Minimum 30 lbf/sq. in. (207 kPa) <**Insert value**> when tested according to ASTM D 4541.
e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
f. UV Resistance: Can be exposed to sunlight for 180 <**Insert number**> days according to manufacturer's written instructions.

2.4 ACCESSORY MATERIALS

A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

B. Primer: Liquid waterborne or solvent-borne primer recommended for substrate by air-barrier material manufacturer.

C. Preformed Silicone Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
3. Verify that substrates are visibly dry and free of moisture.
4. Verify that masonry joints are flush and completely filled with mortar.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.

B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching material.

E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.

G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

H. Bridge isolation joints and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

3.3 ACCESSORIES INSTALLATION

A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install transition strip on roofing membrane or base flashing so that a minimum of 3-inches of coverage is achieved over each substrate.
3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
4. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.

B. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

C. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

D. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

E. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply preformed silicone extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
1. Preformed Silicone Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

F. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch-wide, transition strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counter-flashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fish-mouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION

A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.

B. Medium-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply an increased thickness of air-barrier material in full contact around protrusions such as masonry ties.
1. Vapor-Permeable, Medium-Build Air Barrier: Total dry film thickness as recommended in writing by manufacturer to comply with performance requirements, applied in two equal coats. Apply additional material as needed to achieve void- and pinhole-free surface, but do not exceed thickness on which required vapor permeability is based.

C. Do not cover air barrier until it has been tested and inspected by testing agency.

D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.5 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 07 41 13.16 STANDING-SEAM METAL ROOF PANELS

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 standing-seam metal roof panels.

1. Related Requirements:

a. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be installed and manufacturer's standard detail drawings applicable to this project.

1. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

B. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar trim samples and accessories involving color selection.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size

indicated below:

1. 12-inch-long by actual panel width sample of roof panel with selected factory-applied color finishes.
2. Clips, fasteners, closures, and other metal panel accessories.

D. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to be included in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have received training from metal panel manufacturer for installation of the specified roof panel system, and:

1. Having and using only equipment authorized and inspected by metal panel manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Build mockups for typical roof area and eave, including fascia, soffit, attachments, accessories, roof insulation as shown on Drawings.
    a. Size: [12 ft. (3.5 m) long by 6 ft. (1.75 m)] square by full thickness.
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. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Exercise extreme care in unloading, storing, and installing metal panels to prevent bending, warping, twisting, and surface damage.

C. Store products above ground on well-supported platforms that provide minimum of 1:48 slope to allow moisture run-off. Store under waterproof covering or indoors and provide proper

ventilation of metal components to prevent condensation build-up between metal components. Do **not** store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit. Assembly of metal panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Manufacturer’s warranty is in addition to, and not a limitation of, other rights the owner may have under the contract documents.

C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
   1. Limit of Liability: No dollar limitation.
   2. Failures include, but are not limited to, the following:
      a. Structural failures including rupturing, cracking, or puncturing.
      b. Deterioration of metals and other materials beyond normal weathering.
      c. Defective workmanship used to install these materials.
   3. Warranty Period: 2 years from date of Substantial Completion.

D. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested 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. Finish Warranty Period: 20 years from date of Substantial Completion.

E. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Standing Seam Metal Panel, Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design: **SLR-16-0 Profile** by **Morin A Kingspan Group Company**. or comparable product by one of the following:

1. Pac-Clad – **Tite-Loc Panel**
2. Western States Metal Roofing – **MS2**

B. Roof Insulation System, Basis-of-Design Product: **Simple Saver System** by **Thermal Design, Inc.**

C. Substitutions: See Section 01 60 00 - Product Requirements.

2.2 ROOFING SYSTEM DESCRIPTION

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in the seam. Include clips, bearing plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.

1. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.
   a. Nominal Thickness: 22 gauge.
   b. Exterior Finish: **Two-coat** fluoropolymer containing 70% PVDF resins: 0.2 mil. primer with 0.8 mil. color coat.
   c. Color: As selected by Architect from Morin Standard Paint Colors - **Regal White.**

C. Clips: Two-piece floating to accommodate thermal movement. Retain one of two "Material" subparagraphs below.

1. Material: 22-gauge nominal thickness upper, **stainless-steel** sheet.

D. Joint Type: As standard with manufacturer.

E. Panel Coverage: 16” width.

F. Panel Rib Height: 2”.

2.3 FABRICATIONS

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate in accordance with equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

1. Sheet Metal Components Associated with Metal Roof Panels: Made by same manufacturer and compatible with roof panels; Or to comply with manufacturer’s

recommendations, and recommendations in SMACNA's "Architectural Sheet metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2. Fabricate trim, flashing, and accessories to roofing manufacturer's specified or approved profiles.
3. Exposed metal components of same finish as panels.
4. Color: Same as panels.
5. Provide the following formed sheet metal components, profile to match the existing building:
   a. Eave.
   b. Rake edge.
   c. Vertical fascia.
   d. Gutters.
   e. Downspouts.
   f. Soffit panels, solid.

2.4 **FASTENERS**

A. In strict accordance with metal roof panel manufacturer's requirements; Minimize exposed fasteners.

B. Installation Clips: Manufacturer's standard stainless steel clips for concealed securement of panels.

C. Clip Fasteners: Stainless steel.

D. Fasteners Exposed to Weather: Sealed or with sealed washers on exterior side of covering to waterproof fastener penetration; washer material compatible with screw head; minimum 3/8 inch diameter washer for structural connections; gasket portion of fasteners or washers made of EPDM, neoprene, or other equally durable elastomeric material.

E. Fasteners Exposed to View: Head of color matching panel or component in which installed.

PART 3 INSTALLATION

2.1 **GENERAL**

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Verify that shop drawings prepared by metal roof panel manufacturer have been approved and are available to installers; do not use drawings prepared by others for installation drawings.

C. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

D. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing

work; repair or restore damage caused by roofing work.

1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

2.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Verify that the substructure installation is in accordance with the approved shop drawings and roof panel manufacturer’s requirements, that the fasteners are correct for the substrate, and the substrate is installed to accommodate and support the appropriate clip spacing and attachment.

D. Verify that installed work of other trades that such work is complete to a point where the roofing system installation may commence.

E. Verify that roof openings, curbs, pipes, sleeves, ducts, vents, and other penetrations through roof substrate are complete and properly located.

F. In event of discrepancy, notify Architect in writing; do not proceed with installation until discrepancies have been resolved.

2.3 ROOF INSULATION SYSTEM INSTALLATION

A. Install straps platform in accordance with manufacturer's instructions.

B. Install vapor barrier liner over straps platform in accordance with manufacturer's instructions.

C. Install fiber-glass blanket insulation over vapor barrier liner and purlins in accordance with manufacturer's instructions.

2.4 ROOF PANEL INSTALLATION

A. Install the metal roof panel system in accordance with the manufacturer’s instructions, installation drawings, and approved shop drawings, so that it is weathertight and allows for thermal movement.

B. Locate and space all fasteners in accordance with roof panel manufacturer’s recommendations. For required exposed fasteners, use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the sealing washers.

C. Do not place utility penetrations through the panel seams.

D. Do not allow panels or trim to come into contact with dissimilar materials (i.e. copper, lead, graphite, treated lumber, mortar, etc). Protect from water run-off from these materials.

E. Perform field cutting of panels and related sheet metal components by means of hand or electric shears. At no time shall a hot/friction saw be used.

F. Remove protective film immediately after installation.

2.5 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by roof panel manufacturer's recommendations and details.

B. Install metal trim, accessories, and edgings in locations indicated on the drawings.

1. Follow roofing manufacturer's instructions.

2. Remove protective plastic surface film immediately before installation.

C. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical.
   2. Where pre-molded pipe flashings are not practical, provide flashing detail as recommended by metal panel manufacturer.

2.6 FIELD QUALITY CONTROL

A. Perform all corrections necessary for issuance of warranty.

2.7 ADJUSTING AND CLEANING

A. Repair panels having minor damage.

B. Remove panels damaged beyond repair and replace with new panels to match adjacent undamaged panels.

C. Clean exposed panel surfaces promptly after installation in accordance with recommendations of panel and coating manufacturers.

D. Clean all contaminants generated by roofing work from building and surrounding areas, including adhesives, sealants, and coatings.

E. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

F. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

2.8 PROTECTION

A. Where construction traffic must continue over finished roof panels, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION 07 41 13

SECTION 07 42 13 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exposed-fastener metal wall panels, solid.
2. Accessories including exposed-fastener, perimeter trim and penetration treatments.

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.

1.3 RELATED REQUIREMENTS

A. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

B. Division 07 Section "Joint Sealants" for field-applied joint sealants.

C. Division 07 Section “Interior Expansion Joint Cover Assemblies” for interior vertical expansion joint system.

D. Division 07 Section “Exterior Expansion Joint Cover Assemblies” for Exterior vertical expansion joint system.

E. Division 10 Section “Dimensional Letter Signage” for metal letter signages and mounting systems.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal panel assembly during and after installation.
8. Review of procedures for repair of metal panels damaged after installation.

9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

B. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated for disengagement, per ASTM E 72.

1. Wind Loads: Determine loads based on uniform pressure, importance factor, exposure category, and basic wind speed indicated on drawings.
2. Limits of Deflection: Metal wall panel assembly shall withstand scheduled wind pressure with the following allowable deflection:
    a. Maximum allowable deflection limited to L/180 deflection of panel perimeter normal to plane of wall with no evidence of failure.
3. Secondary Metal Framing: Design secondary metal framing for metal wall panel assembly according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
4. Side Joint Disengagement: Panels must be designed and tested under Negative load per ASTM E 72.

C. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.

D. Wall systems that incorporate foam plastic insulation must be tested by the foam plastic supplier in accordance with NFPA-285.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal panel assembly as part of overall building mock-up, including corner, supports, attachments, and accessories.
2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
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 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.

1. Coordinate building framing in relation to metal wall panel assembly.
2. Coordinate installation of building air barrier and insulation behind metal wall panel assembly.
3. Coordinate doors, metal letter signage and other openings and penetrations of metal wall panel assembly.
4. Coordinate existing roof assembly in relation to metal wall panel assembly.

1.8 ACTION SUBMITTALS

A. Product Data: Manufacturer’s data sheets, for each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory, and data indicating compliance with performance requirements, including load span tables tested for side joint disengagement under negative loads per ASTM E 72.

B. Delegated Design: Design metal wall panel assembly, submit comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied finishes.

1. Include Samples of trim and accessories involving color selection.
2. For each product specified. Provide representative color charts of manufacturer's full range of colors.

E. Samples for Verification: Provide 12 inches (305 mm) by actual panel width section of panel(s) showing finishes, including fasteners, closures, and other metal panel accessories.

1.9 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

B. Qualification Information: For Installer firm.

C. Manufacturer's warranty: For special warranties.

1.10 CLOSEOUT SUBMITTALS

A. Maintenance data: For metal panels to include in maintenance manuals.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Single-skin exposed fastener metal wall panels applied as exterior cladding over wall framing specified in Division 05 Section "Cold-Formed Metal Framing" with exterior sheathing specified in Division 06 Section "Sheathing", an applied membrane that provides air, moisture, and water vapor control specified in Division 07 Section " Fluid-Applied Membrane Air Barriers", and insulation applied outboard of the sheathing specified in Division 07 Section "Thermal Insulation." Metal wall panel installation specified in this Section includes secondary metal subgirt framing for panel attachment.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Basis of Design exposed-fastener metal wall panels by Motin A Kingspan Group Company. or comparable product by one of the following:

1. Pac-Clad.
2. MBCI.

2.3 PANEL MATERIALS, GENERAL

A. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

1. Nominal Thickness: 22 Gauge.
2. Exterior Finish: **Two-coat** fluoropolymer containing 70% PVDF resin: 0.2 mil. Primer with 0.8 mil. Color coat.
3. Color: As selected by Architect from manufacturer's full range of standard colors.

2.4 EXPOSED-FASTENER METAL WALL PANELS, SOLID

A. Basic of Design Product: Box Rib Profile, Exposed-Fastener, Solid, Metal Wall Panels. Formed with raised, box-shaped ribs, evenly spaced across panel width, and with rib/recess sides angled 60 degrees or more.

1. Profile: **Exposed BR-35, Profile A**
2. Color: Refer also to architectural drawings for location of each color.
   a. **Color #1** – Ascot White
   b. **Color #2** – Chromium Gray
   c. **Color #3** – Zinc Gray
3. Panel Thickness: 1-1/2 inches (38 mm)
4. Rib Spacing: 7 inches (178 mm) O.C.

B. Horizontal Joints: Horizontal Joints with drip edge and sloped drain shelf to provide positive water shed away from Panel Joinery.

2.5 METAL WALL PANEL ACCESSORIES

A. Miscellaneous Metal Sub-framing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or pre-molded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, end-walls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are non-staining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.6 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate in accordance with equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

2.7 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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 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 metal wall panel substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal wall panels.

B. Wall Substrate: Confirm that wall substrate is within tolerances acceptable to metal wall panel system manufacturer.

1. Maximum deviations acceptable:

a. 1/4-inch in 20 feet (6.4 mm in 6 m) vertically or horizontally from face plane of framing.

b. 1/2-inch (12.7 mm) across building elevation.

c. 1/8-inch in 5 feet (3.2 mm in 1.5 m).

C. Framing: Inspect framing that will support metal wall panels to determine if support components are installed as indicated on approved shop drawings. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal wall panels.

D. Openings: Verify that window, door, louver and other penetrations match layout on shop drawings.

E. Air/Moisture Barriers: Confirm that work has been completed, inspected, and tested as required.

F. Correct out of tolerance work and other deficient conditions prior to proceeding with panel installation.

3.2 METAL WALL PANEL INSTALLATION

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Panel Penetrations are not permitted. Notify the Architect prior to roughing-in items that would cause a penetration in the metal panels for coordination of locations. If required, Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use **stainless steel** fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
3. Flash and seal panels with weather closures at perimeter of all openings.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.

2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal wall panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed joints).

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

C. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

D. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13

SECTION 07 62 00 – FLASHING & SHEET METAL

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. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and other items indicated on Drawings, as required to complete the Work and to make the building weathertight.

B. Related requirements
   1. 07 41 13.16 – Standing-Seam Metal Roof Panels
   2. 07 42 13.13 – Formed Metal Wall Panels

1.3 REFERENCE STANDARDS

A. ASTM - American Society of Testing and Materials. A society formed for the development of standards on characteristics and performance of materials, products, systems and services; and the promotion of related knowledge.

B. U L – Underwriters' Laboratories. A non-profit, independent organization which tests devices, systems and materials to determine their performance to life, fire, casualty hazards and crime prevention.

C. ANSI – American National Standards Institute. A private non-profit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States.

D. F M – Factory Mutual or Factory Mutual Research Corporation. Has a charter similar to Underwriters' Laboratories.

E. SMACNA – Sheet Metal and Air Conditioning Contractors National Association.

F. AIA – American Institute of Architects

G. NRCA – National Roofing Contractors Association.

H. SCBC – South Carolina Building Code, 2018 Edition

I. SCPC – South Carolina Plumbing Code, 2018 Edition

J. SCEBC – South Carolina Existing Building Code, 2018 Edition

K. IECC – International Energy Conservation Code, 2009 Edition

L. OSHA – Occupational Safety and Health Administration

M. NFPA – National Fire Protection Association

N. ASCE 7 – Minimum Design Loads and associated criteria for buildings and other structures; most recent edition cited by referring code or reference standard.

O. ANSI/SPRI ES-1: Code required test standard for edge metal.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. All product data shall be the manufacturer’s latest edition.

B. Safety Data: For each type of product.

C. Shop Drawings: Shall be full and complete showing all material to be installed and label fastener spacings, materials used, and measurements.

   1. Drip Edge Detail
   2. Counter Flashing Detail

D. Certificates:
   1. Submit evidence satisfactory to Owner/Designer that the proposed applicator is currently approved by the manufacturer of the roofing materials. Submit copies of "Certificate of License" issued to roofing applicator by manufacturer.
   2. Submit metal fabricator’s ANSI/SPRI ES-1 approval.

E. Reports
   1. Prior to start of installing work of this Section, and as part of the required written report on the Pre-Application Roofing Conference, submit a written and detailed step-by-step description of the methods of installation as agreed to in the Pre-Application Roofing Conference.
   2. Contractor shall provide ES-1 test data for edge details.

1.5 PROJECT MEETINGS

A. Pre-Application Roofing Conference
   1. Approximately two weeks prior to scheduled commencement of roofing installation and associated work, arrange a meeting at project site with installers of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of roof-top units and other work in and around roofing which must precede or follow roofing work including mechanical and electrical work, Owner, roofing system manufacturer's representative, and other representatives directly concerned with performance of the work. Record discussions of conference and decisions and agreements (or disagreements) reached and furnish copy of record to each party attending.
   2. Review methods and procedures related to roofing work, including, but not necessarily limited to, the following:

a. Review roofing system requirements (Drawings, Specifications, and other Contract Documents) for possible conflicts and resolve.
b. Communication channels and procedures. Organization of contractor, subcontractor, and suppliers.
c. Review required submittals, both completed and yet to be completed.
d. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
e. Review required inspection, testing, certifying, and materials usage accounting procedures.
f. Field change orders and procedures
g. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not a mandatory requirement).
h. Construction schedule
i. Review work safety requirements.
j. Review interior protections and inspection schedule for interiors.

B. Ongoing Construction Meetings
1. Project meetings shall be conducted at a minimum of once every two-weeks.
a. Project meetings may be conducted virtually unless designer requires an onsite meeting. Only requested individuals will be required to be onsite.
b. Review construction schedule
c. Review Change Orders
d. Review quality control
e. Review problems/issues encountered, and actions taken.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience, and members of SMACNA, Architectural Division.

D. Contractor shall ensure all materials provided are compatible with the other components of the Work, are acceptable for the specified use, and meet the requirements of the Specifications.

1.7 PRODUCT HANDLING

A. Shop form all metal shapes, which are to be formed of prefinished metal, with protective plastic film in place. Do not remove plastic film until just prior to (or, if possible, after) installation.
1. Shop required to be ES-1 certified.
2. Plastic film must be removed prior to completion of installation.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

1.8 PROJECT CONDITIONS

A. Existing Conditions:
   1. Along with the roofing applicator and sheet metal installer, verify existing conditions, including:
      a. Roof deck conditions.
      b. Varying deck and wall thickness for length of anchoring devices required.
   2. Replace or restore to original condition all materials or work damaged during construction of work of this Section.
   3. Protect paving and building walls adjacent to hoists and trash chute when applicable.
      a. Lap protective materials at least 6 in.
      b. Vent plastic sheets are not allowed for purpose of covering materials.
      c. Secure protective coverings against wind.
      d. Leave protective coverings in place until roofing work has been completed.

B. Environmental Requirements:
   1. Do not install roofing during rain or start roofing if rain is probable during installation.
   2. Do not install roofing when there is ice, frost, surface moisture, or dampness visible on the surface to which roofing is to be applied. The relative humidity shall not be higher than 90%.
   3. Do not install roofing if temperatures are 45ºF or lower, unless approved otherwise by the Owner & Manufacturer.

C. Protection:
   1. Protect surfaces not intended to receive roofing materials from spillage, dripping, spotting and damage during application of the roofing. Should protection not be effective, or not be provided, restore the respective surfaces to their proper conditions by cleaning, repairing, or replacing, as applicable for the circumstances and as directed by Owner.
   2. Immediately protect completed portions of roofing from damage of subsequent construction activities in accord with contract requirements. Repair, replace, or as otherwise required to remedy any damage to roofing resulting from construction activities, for the entire duration of construction.

PART 2 - PRODUCTS

2.1 ALUMINUM:

A. ASTM B209, minimum 0.040” thick.

2.2 KYNAR 500-BASED FINISH:

A. Shall be factory applied, oven-finish. Finish and primer shall be applied in strict accordance with the formulator's specifications and shall meet the performance criteria of AAMA 605.2-90 specification. Finish coat thickness shall be a minimum of 1.0 mil. Primer coat thickness shall be a minimum of 0.3 mil. Color to match the existing color to be selected by owner.

2.3 NON-SHRINKING SEALANT:

A. ASTM C920, Type S or M, Grade NS, Class 25, for Use NT, M, A, and O.

2.4 METAL WEIGHTS

A. Minimum Acceptable Metal Weights (All metal to be finished with Kynar 500 coating or approved equal prior to bid unless otherwise specified).

1.	A-Style Eave Flashing:	0.040-inch-thick aluminum (membrane-clad)
2.	A-Style Eave Flashing Cleat:	0.050-inch-thick aluminum (mill finish)
3.	L-Style Eave Flashing:	0.040-inch-thick aluminum (membrane-clad)
4.	L-Style Eave Flashing Cleat:	0.050-inch-thick aluminum (mill finish)
5.	Coping:	0.040-inch-thick aluminum
6.	Coping Cleat:	0.050-inch-thick aluminum (mill finish)
7.	Counterflashing:	0.040-inch-thick aluminum
8.	Conductor Head:	0.050-inch-thick aluminum
9.	Downspout:	0.040-inch-thick aluminum
10.	Tie In Metal Cap	0.050-inch-thick aluminum
11.	Tie in Metal Cap Cleat	0.050-inch-thick aluminum (mill finish)
12.	Face Extender	0.040-inch-thick aluminum
13.	Face Extender Cleat	0.050-inch-thick aluminum (mill finish)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS:

A. Inspect all surfaces to which metal is to be applied. Do not install metal unless surfaces are even, sound, clean, dry and free from defects which might affect the application.

B. Follow recommendations of the National Roofing Contractors' Association (NRCA) and Sheet Metal and Air Conditioning Contractors National Association Architectural Sheet Metal Manual (7th Edition) for fabricating in-shop and on-site, and for installation, unless otherwise specified herein.

C. Metal flashings installed at edges and/or parapets of low-sloped roofing shall adhere to ANSI/SPRI ES-1 wind uplift requirements, as necessary. Specified fastening along with metal flashing thicknesses, gauges, and/or weights listed herein are the minimum required. In the event additional fastening or thicker, lower gauge, or heavier metal flashings are required, the contractor shall satisfy the requirements of ANSI/SPRI ES-1. In some instances, shop-formed metal flashings cannot satisfy ANSI/SPRI ES-1 requirements without additional testing or proprietary systems are necessary. Such cost for testing and/or propriety systems shall be included in the Bid as required.

D. Follow published instructions of the product manufacturer for installation of extruded or proprietary metal products, unless otherwise specified herein.

E. Use nails, screws, bolts, cleats or other fasteners of the same material or of material chemically compatible with the contacted metal.

F. Fabricate cleats to be a minimum of one gauge heavier than fascia metal.

G. Do not place dissimilar metals in direct contact or in positions where water sheds across both metals.

H. Install metal to be water and weather tight with lines, arises and angles sharp and true and with paint surfaces free of waves and buckles.

I. Install shop-formed metal flashings in 10-foot lengths maximum with a minimum number of pieces in each straight run.

J. Shop form all metal shapes, which are to be formed of prefinished metal, with protective plastic film in place. Do not remove plastic film until just prior to (or, if possible, after) installation.

K. At all corners, shop form corner pieces of fascia and drip edge flashing from a single section of metal with minimum 36-inch legs on either side of the corner.

L. Cleats: Cleats shall be secured with nails that penetrate the wood a minimum of 1 inch at spacings not to exceed 6 inches on center. Nails shall be applied along the vertical face of the wood blocking and located approximately 1-3/4-inch from the bottom of the cleat. Metal flashing drip legs shall be fold snugly over the cleat.

M. Lapped Metal: Refer to NRCA Detail SM-01 and Drawings. Apply a continuous bead of caulk between any lapped metal sections, except for counterflashing lapped joints. The application of caulk after metal components have been lapped is unacceptable and will be grounds for rejection.

3.2 A-STYLE FLASHING:

A. At locations shown on Drawings, furnish and install new A-type flashing. The flashing shall extend a minimum of 1 inch above the roof level. The flashing shall have a 4-inch horizontal flange. Refer to NRCA Details SM-14 and UL-27A and Drawings. The flashing shall cover the exterior wall cladding a minimum of 1 inch; however, the vertical flange of the flashing shall not be more than 8 inches. If additional area of wall needs to be covered with flashing to match the existing, furnish and install new face extenders. Install face extender prior to installing flashing.
   1. Prior to installing the flashing, ensure the roof membrane ends down the exterior face of the wall a distance to the match the flashing but exceeds the length of the wood blocking.
   2. Set horizontal flange in a continuous bead of sealant on top of the roofing.
   3. At low and high eaves, join sections using cover plates.
   4. At rake eaves, join sections by lapping.

B. Flashing shall engage a continuous cleat.

C. Form new A-style closures using similar metal as shown on Drawings.

D. Strip in the flange as specified elsewhere.

3.3 L-STYLE FLASHING:

A. At locations shown on Drawings, furnish and install new A-type flashing. The flashing shall have a 4-inch horizontal flange. Refer to NRCA Details and UL-31 and Drawings. The flashing shall

cover the exterior wall cladding a minimum of 1 inch; however, the vertical flange of the flashing shall not be more than 8 inches. If additional area of wall needs to be covered with flashing to match the existing, furnish and install new face extenders. Install face extender prior to installing flashing.

1. Prior to installing the flashing, ensure the roof membrane ends down the exterior face of the wall a distance to the match the flashing but exceeds the length of the wood blocking.
2. Set horizontal flange in a continuous bead of sealant on top of the roofing.
3. At rake eaves, join sections by lapping. No laps shall be present within scuppers, primary or overflow.

B. Flashing shall engage a continuous cleat. Cleat is not required at conductor head locations.

C. Form new L-style closures using similar metal as shown on Drawings.

D. Strip in the flange as specified elsewhere.

3.4 COUNTERFLASHING:

A. Form and install new continuous skirt counterflashing as shown on drawings and around all RTU curbs. Refer to 2010 NRCA, Detail SM-24 (skirt flashing) and drawings. Slide the top edge of the counterflashing behind existing metal flashing a minimum of 1-inch. Set flange against vertical surface in a solid bed of sealant. Secure the counterflashing using appropriate fasteners at spaced no more than 12 inches on center.

1. Extend counterflashing down a minimum of 4 inches over base flashing. Secure counterflashing to the reglet using stainless-steel fasteners at spacings not to exceed 12 inches on-center. It is acceptable to provide premanufactured snap-lock counterflashing.
2. Notch and lap reglet and counterflashing sections a minimum of 3 inches, and offset laps between reglet and counterflashing a minimum of 12-inches.
3. Notch and lap joints and inside corners. Notch and seam outside corners. Do not rivet or otherwise secure joints and corner.
4. Fill the cove at the top of the counterflashing with a non-shrink caulk.
   a. Note: A cove is not required where counterflashing is behind a frame and/or existing sheet metal flashing.

3.5 CONDUCTOR HEAD INSTALLATION:

A. Furnish and install new conductors at all primary through-wall scupper locations. Refer to SMACNA Architectural Sheet Metal Manual Figure No. 1-27A and Drawings. Conductor head shall be a minimum of 1” lower than the scupper opening to allow for overflow.

B. Size the conductor in accordance with the following requirements:

Face Width: 4 times downspout width

Face Depth: 2 times downspout width

Height: 4 times downspout width

C. Sealant shall be applied between all lapped joints. The application of caulk at lapped joints after sections are joined is not acceptable.

D. Install conductor so that the top is 1-inch lower than the scupper opening. Secure to the wall with a minimum of 2 specified friction fasteners near the top corners. Outside edges of the scupper shall be turned out onto the back of the conductor a minimum of one inch.

E. The outlet tube shall be fabricated to extend into the downspout a minimum of 4 inches.

3.6 DOWNSPOUT INSTALLATION

A. Form new downspouts from 0.040" thick aluminum with finish to match the existing downspouts.

B. New downspouts shall match the adjacent existing downspouts' profile and size, unless otherwise specified.

C. Lap sections a minimum of 3 inches and secure sections with a minimum of 2 stainless steel sheet metal screws.

D. Form 45º elbow where water discharges onto the roof or ground.

E. Form downspout hangers from the same material as downspouts using material not less than 2 gauges heavier than downspouts. Secure downspouts to wall with hangers spaced not more than 5 feet on center, and a maximum of 2-feet from the top and 2-feet from the bottom of the downspout. Refer to SMACNA Architectural Sheet Metal Manual Figure 1-35G. Apply one coat of metal primer and two coats of field-grade Kynar 500 paint to all hangers. Color shall match the downspouts.

END OF SECTION 07 62 00

SECTION 077200 - ROOF 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. Pipe and duct supports.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for metal vertical ladders for access to roof hatches.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, and miscellaneous sheet metal trim and accessories.

1.3 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.

2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Sample Warranties: For manufacturer's special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 PIPE AND DUCT SUPPORTS

A. Fixed-Height Roller-Bearing Pipe Supports: Polycarbonate pipe stand with stainless-steel roller carrying assembly accommodating up to [**7-inch- (178-mm-)**] diameter pipe or conduit; with provision for pipe retainer and with manufacturer's support pad or deck plate as recommended for penetration-free installation over roof membrane type; as required for quantity of pipe runs and sizes.

B. Curb-Mounted Pipe Supports: Galvanized steel support with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with adjustable-height roller-bearing pipe support accommodating up to 20-inch- (508-mm-) diameter pipe or conduit and with provision for pipe retainer; as required for quantity of pipe runs and sizes.

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. MIRO Industries, Inc.
   b. Pate Company (The).
   c. PHP Systems/Design.
   d. Thaler Metal Industries Ltd.

C. Duct Supports: Extruded-aluminum, urethane-insulated supports, 2 inches (50 mm) in diameter; with manufacturer's recommended hardware for mounting to structure or structural roof deck.

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. Eberl Iron Works, Inc.
   b. Thaler Metal Industries Ltd.

2. Finish: Manufacturer's standard.

2.3 PIPE PORTALS

A. Curb-Mounted Pipe Portal: Insulated roof-curb units with welded or mechanically fastened and sealed corner joints, straight sides, and integrally formed deck-mounting flange at perimeter bottom; with weathertight curb cover with single or multiple collared openings and pressure-sealed conically shaped EPDM protective rubber caps sized for piping indicated, with stainless-steel snaplock swivel clamps.

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. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.

B. Flashing Pipe Portal: Formed aluminum membrane-mounting flashing flange and sleeve with collared opening and pressure-sealed conically shaped EPDM protective rubber cap sized for piping indicated, with stainless-steel snaplock swivel clamps.

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. Roof Products and Systems (RPS); a division of Hart & Cooley, Inc.

2.4 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and metal collar.

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. Custom Solution Roof and Metal Products.
   b. Thaler Metal Industries Ltd.

2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.

3. Diameter: As necessary for penetration.

4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

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. Custom Solution Roof and Metal Products.
   b. Lifetime Tool & Building Products, LLC.

c. Milcor; Commercial Products Group of Hart & Cooley, Inc.
d. Thaler Metal Industries Ltd.

2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Height: 7 inches (175 mm).
4. Diameter: As necessary for penetration.
5. Finish: Manufacturer's standard.

C. Roof Mast for antenna: Permanently mounted mast attached to high roof vertical wall with pipe penetration sleeves, flashing and weather head for BDA system and other antenna.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work.
2. Metal: Steel 1.66” O.D. minimum.
3. Height: 3’-0” minimum above the high roof or as required to receive proper signal.
4. Flashing: Penetration metal flashing sleeve, uninsulated with integral flange.
5. Finish: Manufacturer’s standard.
6. Conduit: Provide a minimum of (2) 3/4" conduit with weather head adjacent to the mast. Terminate conduit above ceiling of the top most level. Equipment, wiring and terminations shall be by others.

2.5 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.

1. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.
2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

D. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

E. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

F. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

G. Steel Tube: ASTM A 500/A 500M, round tube.

H. Galvanized-Steel Tube: ASTM A 500/A 500M, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

I. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.6 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

E. Underlayment:

1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
4. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
5. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.

6. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
7. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

I. Asphalt Roofing Cement: ASTM D 4586**/**D 4586M, asbestos free, of consistency required for application.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.

4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Pipe Support Installation: Comply with MSS SP-58 and MSS SP-89. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.

1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.

D. Preformed Flashing-Sleeve and Flashing Pipe Portal Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane according to roof membrane manufacturer's instructions.

E. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 079200 - JOINT SEALANTS

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. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Solvent-release-curing joint sealants.
5. Acoustical joint sealants.

B. Related Requirements:

1. Division 4 Section "Unit Masonry" for masonry control and expansion joints.
2. Division 8 Section “Glazing” for glazing sealants
3. Division 9 Section “Gypsum Board” for sealing perimeter joints.
4. Division 9 Section “Acoustical Panel Ceilings” for sealing edge moldings at perimeters with acoustic sealants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. 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.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency indicating that sealants comply with requirements.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

D. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

E. Field-Adhesion-Test Reports: For each sealant application tested.

F. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.

3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone substrates.
4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.

1.8 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.
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.

1.9 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 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. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, non-sag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; 890.
   b. Dow Corning Corporation; 790.
   c. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   d. Sika Corporation, Construction Products Division; SikaSil-C990.
   e. Tremco Incorporated; Spectrem 1.

2.3 URETHANE JOINT SEALANTS

A. Urethane, S, NS, 25, NT: Single-component, non-sag, 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. Products: Subject to compliance with requirements, provide one of the following:
   a. Sika Corporation, Construction Products Division; Sikaflex - 1CSL.
   b. Tremco Incorporated; Vulkem 45.

2.4 IMMERSIBLE JOINT SEALANTS

A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C 1247, Class 1; tested in deionized water unless otherwise indicated

B. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T, NT, and I.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Sika Corporation, Construction Products Division; Sikaflex - 1CSL.
   b. Tremco Incorporated; Vulkem 45.

2.5 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, non-sag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Omniplus.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Advanced Materials - Silicones; Sanitary SCS1700.
   d. May National Associates, Inc.; Bondaflex Sil 100 WF.
   e. Tremco Incorporated; Tremsil 200 Sanitary.

2.6 POLYSULFIDE JOINT SEALANTS

A. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Sonolastic Polysulfide Sealant.
   b. Pecora Corporation; Synthacalk GC-2+.

2.7 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Pecora Corporation; BC-158.
   b. Bostik, Inc.; Chem-Calk 300.
   c. Tremco Incorporated; Tremco Butyl Sealant.
2. Location: mastic under thresholds.

2.8 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; AC-20+.
   b. BASF Building Systems; Sonolac.
   c. Bostik, Inc.; Chem-Calk 600.
   d. Tremco Incorporated; Tremflex 834.

2.9 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Non-staining; 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 C 1330, Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, 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: Non-staining, 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. 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 C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind 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 Non-sag 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 per Figure 8A in ASTM C 1193 unless otherwise indicated.
4. Provide flush joint profile at locations indicated on Drawings according to Figure 8B in ASTM C 1193.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
   a. Perform 10 tests for the first 1000 feet (300 m) of joint length for each kind of sealant and joint substrate and one test for each 1000 feet (300 m) of joint length thereafter.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 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.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.

1. Joint Locations:
   a. Control and expansion joints in brick pavers.
   b. Isolation and contraction joints in cast-in-place concrete slabs.
   c. Joints between different materials listed above.
   d. Other joints as indicated on Drawings.
2. Polysulfide Joint Sealant: Multi-component, non-sag, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion - JS-2.

1. Joint Locations – pedestrian and vehicular paving
2. Urethane Joint Sealant: Immersible, single component, pourable, traffic grade.
3. Polysulfide Joint Sealant: Immersible, multicomponent, non-sag, traffic grade.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-4.

1. Joint Locations:
   a. Isolation joints in cast-in-place concrete slabs.
   b. Other joints as indicated.
2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
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 JS-5.

1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Other joints as indicated.
2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50**.**
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 JS-6.

1. Joint Locations:
   a. Vertical joints on exposed surfaces of interior unit masonry and partitions.
   b. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
   c. Other joints as indicated.
2. Joint Sealant: Latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces “Masonry Control Joint” noted on plans and elevations.

1. Joint Locations:
   a. Control joints in unit masonry.
   b. Joints between brick and metal.
   c. Joints between different materials.
   d. Perimeter joints between materials listed above and frames of doors and storefront.
   e. Control and expansion joints in ceilings and other overhead surfaces.
   f. Other joints as indicated.
2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50**.**
3. Joint-Sealant Color: As indicated on drawings.

G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-7.

1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Other joints as indicated.
2. Joint Sealant: Single component, non-sag, mildew resistant, acid curing.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

H. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces JS-8.

1. Joint Location:
   a. Acoustical joints where indicated.
   b. Other joints as indicated.
2. Joint Sealant: Acoustical.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 07 95 13 - EXPANSION JOINT COVER ASSEMBLIES

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 interior expansion joint cover assemblies.

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 expansion joint cover assemblies.

B. Shop Drawings: For each expansion joint cover assembly.

1. Include plans, elevations, sections, details, splices, block-out requirement, attachments to other work, and line diagrams showing entire route of each expansion joint.
2. Where expansion joint cover assemblies change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

C. Samples for Verification: For each type of expansion joint cover assembly, full width by 6 inches (150 mm) long in size.

D. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Expansion Joint Design:

1. Type of Movement: Seismic Expansion Joint.
   a. Nominal Joint Width: **2”**.
   b. Minimum Joint Width: 1.25”.
   c. Maximum Joint Width: 3”.
2. Type of Movement: Seismic.

2.3 WALL & CEILING EXPANSION JOINT COVERS

A. Elastomeric-Seal Wall Joint Cover: Assembly consisting of elastomeric seal anchored to frames fixed to sides of joint gap.

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. MM Systems Corporation – Basis of Design – **VSS-200**
   b. Balco, Inc.
   c. Construction Specialties, Inc.
2. Application:
   a. Wall to wall
   b. Wall to corner
   c. Ceiling
3. Fire-Resistance Rating: Na
4. Exposed Metal:
   a. Aluminum: Mill.
5. Seal: Preformed elastomeric membranes or extrusions.
   a. Color: As Selected by the Architect from the Manufacturer’s Full Color Range.
6. Secondary Moisture Barrier
   a. Exterior Locations: Provide Secondary Moisture Barrier
   b. Interior Locations: Secondary Moisture Barrier is not required.

2.4 EXTERIOR EXPANSION JOINT COVERS

A. Exterior Metal-Plate Joint Cover: Assembly consisting of sliding metal cover plate in continuous contact with gaskets mounted on metal frames fixed to sides of joint gap.

1. Field constructed expansion joint covers fabricated in accordance with SMACNA Architectural Sheet Metal Manual, 7th Edition.
2. Application: Wall to wall / Wall to Roof.
3. Installation: Surface mounted with concealed counter-flashing.
4. Fire-Resistance Rating: Not less than that of adjacent construction.

5. Exposed Metal:
    a. Aluminum: Clear anodic, Class II Manufacturer's standard.
        1) Color: As selected by Architect from full range of industry colors and color densities.
6. Secondary Moisture Barrier
    a. Exterior Locations:
        1) Provide Secondary Moisture Barrier.
        2) Continuous Counterflashing.
        3) Continuous Reglet.

2.5 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.

1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 ALUMINUM FINISHES

A. Mill finish.

2.7 ACCESSORIES

A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.

B. Manufacturer's standard attachment devices. Include anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion joint cover assemblies will be installed for installation tolerances and other conditions affecting performance of the Work.

B. Notify Architect where discrepancies occur that will affect proper expansion joint cover assembly installation and performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.

1. For field constructed expansion joint covers, fabricate and install expansion joint covers in accordance with SMACNA Architectural Sheet Metal Manual, 7th Edition.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.

1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
2. Install frames in continuous contact with adjacent surfaces.
   a. Shimming is not permitted.
3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

E. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

F. Moisture Barriers: Install secondary moisture barrier at all exterior locations.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion joint cover assemblies. Reinstall cover plates or seals prior to Substantial Completion.

END OF SECTION 079513

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.
2. Hollow metal sidelight, borrowed lite and transom frames.
3. Glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
4. Division 08 Section "Door Hardware".
5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
6. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.

12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of anchorages, joints, field splices, and connections.
6. Details of accessories.
7. Details of moldings, removable stops, and glazing.
8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:

1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
2. Smoke Control Door Assemblies: Comply with NFPA 105.

a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).
3. Pioneer Industries (PI).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors: Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard vertical steel-stiffener core. Minimum 22 gauge steel-stiffeners at 6 inches on-center construction attached by spot welds spaced not more than 5" on centers. Spaces between stiffeners filled with fiberglass insulation (minimum density 0.8#/cubic ft.).
3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), minimum 16 gauge (0.053-inch - 1.3-mm) thick steel, Model 1.
4. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
5. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
6. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. Curries Company (CU) - Steel-Stiffened - 747 Series.
2. Curries Company (CU) - Temperature Rise - 727 Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. CECO Door Products (C) – Series.
    b. Curries Company (CU) – M Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
3. Manufacturers Basis of Design:

    a. Curries Company (CU) - C Series.
    b. Curries Company (CU) - M Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Electrical Thru-Wiring: Provide hollow metal frames receiving electrified hardware with loose wiring harness (not attached to open throat components or installed in closed mullion tubes) and standardized Molex™ plug connectors on one end to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electric through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
8. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".

    a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
    b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.

c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.

9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
10. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.

11. Door Silencers: Except on weather-stripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
12. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Storage: Store doors in a dry interior space prior to installation.

C. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and

secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

D. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

E. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 08 11 13

SECTION 081416 – FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior Flush Wood Veneer Doors:

1. Solid-core wood flush doors.

1.2 RELATED SECTIONS

A. Section 08 12 00 – Metal Frames.

B. Section 08 71 00 – Door Hardware.

C. Section 08 80 00 – Glazing.

1.3 REFERENCES

A. ASTM E 90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

B. ASTM E 413 – Classification for Rating Sound Insulation.

C. AWI/AWMAC/WI Architectural Woodwork Standards, Edition 1, Section 9 – Doors.

D. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.

E. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

F. WDMA Finish System TR-6, Catalyzed Polyurethane.

G. WDMA I.S. 1A-11 – Architectural Wood Flush Doors.

1.4 SUBMITTALS

A. Comply with Section 01330 (01 33 00) – Submittal Procedures.

B. Product Data: Submit manufacturer’s product data, including door construction description and WDMA I.S.1-A and AWS classifications.

C. Schedules: Submit manufacturer’s schedules, including door dimensions, cutouts, species, finish, and hardware. Reference individual door numbers as indicated on the Drawings.

D. Samples: Submit manufacturer’s door finish samples, showing range of color variation.

E. Test Reports: Submit manufacturer's test results of STC ratings from testing performed by independent testing agency for sound-retardant doors.

F. Manufacturer's Certification: Submit manufacturer's certification that doors comply with specified requirements and are suitable for intended application.

I. Cleaning Instructions: Submit manufacturer's cleaning instructions for doors.

J. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

A. Tolerances for Warp, Telegraphing, Squareness, and Pre-fitting Dimensions: WDMA I.S.1-A.

B. Identifying Label: Each door shall bear identifying label indicating:
1. Door manufacturer.
2. Order number.
3. Door number.
4. Fire rating, if applicable.

C. Fire-Rated Doors:
1. Labeled by Intertek/Warnock Hersey
2. Construction Details and Hardware Application: Approved by labeling agency.

3. Core:
   a. Structural Composite Lumber (SCL) and Mineral (MC) Core:
      1) Forest Stewardship Council (FSC) certified.

4. Composite Crossband:
   a. High-Density Fiberboard (HDF):
      1) Forest Stewardship Council (FSC) certified.
      2) Pre-consumer recycled material.
5. Stiles and Rails:
   a. Structural Composite Lumber (SCL):
      1) Forest Stewardship Council (FSC) certified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
1. Deliver doors to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
2. Package doors individually in polybags.

B. Storage:
1. Store doors in accordance with manufacturer's instructions.
2. Store doors in clean, dry area indoors, protected from damage and direct sunlight.
3. Store doors flat on level surface.
4. Do not store doors directly on concrete.
5. Keep doors completely covered. Use covering which allows air circulation and does not permit light to penetrate.
6. Store doors between 50 and 90 degrees F and 25 to 55 percent relative humidity.

C. Handling:
   1. Handle doors in accordance with manufacturer's instructions.
   2. Protect doors and finish during handling and installation to prevent damage.
   3. Handle doors with clean hands or clean gloves.
   4. Lift and carry doors. Do not drag doors across other doors or surfaces.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not subject doors to extreme conditions or changes in temperature or relative humidity in accordance with WDMA I.S.1-A.

1.8 WARRANTY

A. Warrant solid core, interior doors for life of installation against warpage, delamination, and defects in materials and workmanship.

B. Defects noted during warranty period shall be corrected at no cost to Owner. Corrective work shall include labor and material for repair, replacement, refinishing, and rehanging as required.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Wood Veneer Faced Doors:

   1. VT Industries, Inc; Architectural Wood Doors (Basis of Design)
   2. Eggers Industries
   3. Masonite

2.2 GENERAL

A. Glass Mouldings:
   1. Non-rated Flush Doors: VT Industries Style VT1.
   2. Fire-Rated Doors: VT Industries Style "VT1F", matching veneer wrapped non-combustible material.

B. Glazing: As specified in Section 08 80 00.

A. Door Louvers: As specified in Section 10225 (08 91 26).

2.3 FIVE-PLY FLUSH BONDED DOORS

A. Five-Ply Flush Bonded Doors: Heritage Collection. (Basis of Design)

1. Type:
   a. SCL structural composite lumber.

2. Compliance: WDMA I.S.1-A.
   a. Aesthetic Grade: Premium.
   b. Duty Level: Heavy Duty.

3. Door Thickness: 1-3/4 inches.

4. STC Rating:
   a. STC30

6. Stiles:
   a. Structural Composite Lumber (SCL) With Wood Edge: Compatible species as face veneer.
7. Rails:
   a. Structural composite lumber (SCL). Factory Sealed.

8. Core:

   a. Material: Structural composite lumber (SCL)

9. Door Assembly:
   a. Stiles and Rails: Bonded to core.
   b. Sand entire assembly flat as a unit to ensure minimal telegraphing of core components through face veneers.

10. Composite Crossbands:
    a. Apply to core in hot press using Type I, exterior, water-resistant adhesive, before application of hardwood edges.
    b. Exposed Crossbanding: Not allowed along stile edges.

11. Veneers:
    a. Apply to crossbanded core in hot press using Type I, exterior, water-resistant adhesive.
    b. Species: Select White Birch. *verify in field*
    c. Cut: Plain Sliced
    d. Match: Book Match
    e. Assembly: Center balanced.
    f. Minimum Thickness Before Sanding: 1/42 inch.

2.7 FABRICATION

A. Prefit Doors:
   1. Prefit and bevel doors at factory to fit openings.
   2. Prefit Tolerances: WDMA I.S.1-A and AWS Section 9.

B. Factory-machine doors for mortised hardware, including pilot holes for hinge screws and lock fronts required.

2.8 FINISHES

A. Doors shall receive factory finishing.

B. Factory Finishing: WDMA System TR-8, UV cured urethane, premium grade.

   1. Stain and seal to match existing building doors.

D. Top and Bottom Rails: Factory sealed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine locations to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not begin installation until unacceptable conditions are corrected.

B. Ensure frames are solidly anchored, allowing no deflection when doors are installed.

C. Ensure frames are plumb, level, square, and within tolerance.

3.2 PREPARATION

A. Allow doors to become acclimated to building temperature and relative humidity for a minimum of 24 hours before installation.

3.3 INSTALLATION

A. Install doors in accordance with manufacturer’s instructions.

B. Install doors plumb, level, and square at locations indicated on the Drawings.

C. Install door hardware as specified in Section 08 71 00.

3.4 ADJUSTING

A. Adjust doors to swing freely, without binding in frame.

B. Adjust hardware to operate properly.

C. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.

B. Remove and replace damaged doors that cannot be successfully repaired, as determined by Architect.

3.5 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.

D. Do not use harsh cleaning materials or methods that could damage finish.

3.6 PROTECTION

A. Protect installed doors from damage during construction.

END OF SECTION 08 14 16

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated service doors.
   a. Exterior
   b. Manual Doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.

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.

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. Include diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

1. Curtain slats.
2. Bottom bar with sensor edge.
3. Guides.
4. Brackets.
5. Hood.
6. Locking device(s).
7. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

1.6 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 MANUFACTURERS

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in 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 20 lbf/sq. ft. (960 Pa), acting inward and outward.

2. Testing: According to ASTM E330/E330M or DASMA 108 for garage doors and complying with acceptance criteria of DASMA 108.

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 20-lbf/sq. ft. (960-Pa) wind load, acting inward and outward.

C. Seismic Performance: Overhead coiling doors are to withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

2.3 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

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. Wayne Dalton
   b. Advanced Door Technologies.
   c. C.H.I. Overhead Doors, Inc.
   d. Overhead Door Corporation.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000. 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 1.0 cfm/sq. ft. (5.1 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E283 or DASMA 105.

D. STC Rating: 26.

E. Insulate all Overhead Coiling Doors:

1. Insulated Door Curtain R-Value: 4.5 deg F x h x sq. ft./Btu (0.792 K x sq. m/W).

2. 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 Slats: Flat profile slats of 2-5/8-inch (67-mm) center-to-center height.

1. Insulated-Slat Interior Facing: Metal.

2. Gasket Seal. Manufacturer's standard continuous gaskets between slats.

G. 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.

H. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats.

I. Hood: Match curtain material and finish.

1. Shape: Round.

2. Mounting: Face of wall, secured to structure.

J. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.

1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with thumbturn.

K. Manual Door Operator: Chain-hoist operator.

1. Refer to the Door Schedule for manually operated door locations.
   a. Doors 1123G, 2119E, C2103, 2307H, 2308F

L. Curtain Accessories: Equip all overhead doors with weather seals.

M. Door Finish:

1. Factory Prime Finish: Manufacturer's standard color, match the adjacent existing overhead coiling door.

2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.4 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.

2.5 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.

2.6 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.

2.7 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.8 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.

2.9 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 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.

2.10 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum 25-lbf (111-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

2.11 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.

2.12 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: Custom Colored 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.

1. Interior and Exterior of doors, brackets and guides, and hoods shall match Sherwin Williams Color SW7674, Peppercorn.

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 automatic garage doors openers according to UL 325.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to furnish reports to Architect.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 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.

3.5 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.

3.6 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.
2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 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 08 33 23

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
4. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. UL 305 - Panic Hardware.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

   a. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through the Norton Preferred Installer (NPI) program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.
2. Plans for existing and future key system expansion.
3. Requirements for key control storage and software.
4. Installation of permanent keys, cylinder cores and software.
5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

J. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. Hager Companies (HA) - BB Series, 5 knuckle.
   b. McKinney (MK) - TA/T4A Series, 5 knuckle.
   c. dormakaba Best (ST) - F/FBB Series, 5 knuckle.

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

    a. Ives (IV).
    b. Pemko (PE).
    c. Dormakaba Best (ST).

2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

    a. Pemko (PE) - EL-CEPT Series.
    b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

    a. McKinney (MK) - QC-C Series.
    b. No Substitution.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.

2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.

5. Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood (RO).
    c. Trimco (TC).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Door Controls International (DC).
    b. Rockwood (RO).
    c. Trimco (TC).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

6. Manufacturers:

    a. Hiawatha, Inc. (HI).
    b. Rockwood (RO).
    c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU).
    b. No Substitution.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Manufacturer’s Standard.Match Facility Standard.

C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

F. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.
b. No Substitution.

2.7 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty, High Security Monitoring): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed, subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.

1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, deadbolt monitoring, and request-to-exit signaling. Support end-of-line resistors contained within the lock case. Unless otherwise indicated, provide electrified locksets standard as fail secure.

2. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

3. High Security Monitoring: Provide lock bodies which have built-in request to exit monitoring and are provided with accompanying door position switches. Provide a resistor configuration which is compatible with the access control system.

4. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ML20600 NAC Series.
    b. No Substitution.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.

2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.

9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

10. Rail Sizing: Provide exit device rails factory sized for proper door width application.

11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.

1. At openings designed for severe wind load conditions due to hurricanes or tornadoes, provide manufacturer's certified mullion and accessories to meet applicable state and local windstorm codes.

2. Provide keyed removable feature where specified in the Hardware Sets.

3. Provide stabilizers and mounting brackets as required.

4. Provide electrical quick connection wiring options as specified in the hardware sets.

5. Manufacturers:

    a. Same as exit device manufacturer.

2.10 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

4. Manufacturers:

    a. Corbin Russwin Hardware (RU) - ED5000 Series.
    b. Sargent Manufacturing (SA) - 80 Series.

2.11 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.

1. Manufacturers:

   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. Sargent Manufacturing (SA) - 1431 Series.
   c. No Substitution.

2.12 SURFACE MOUNTED CLOSER HOLDERS

A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate.12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.

1. Manufacturers:

   a. LCN Door Closers (LC) - SEM7800 Series.
   b. Norton Rixson (RF) - 980/990 Series.
   c. Sargent Manufacturing (SA) - 1560 Series.

2.13 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.

3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.

4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

   a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

6. Manufacturers:

   a. Hiawatha, Inc. (HI).
   b. Rockwood (RO).
   c. Trimco (TC).

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

   a. Hiawatha, Inc. (HI).
   b. Rockwood (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

   a. Norton Rixson (RF).
   b. Sargent Manufacturing (SA).

2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).

2.16 ELECTRONIC ACCESSORIES

A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Manufacturers:

    a. Alarm Controls (AK) - TS Series.
    b. Securitron (SU) - PB Series.

B. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Manufacturers:

    a. Securitron (SU) - AQL Series.
    b. No Substitution.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and 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 specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

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.

3.5 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should 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 and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. RU - Corbin Russwin
6. SA - SARGENT
7. TC - Trimco
8. RF - Rixson
9. HI – Hiawatha

Hardware Sets

HW SET # 1.0 - Doors: C347, C353
Description: Storeroom Function + Stop-Arm Closer

3	Hinge, Full Mortise	TA2714	US26D	MK
1	Storeroom Lock	ML2057 LWA CT6R	626	RU
1	Interchangeable Core	CR8000- as Required	626	RU
1	Door Closer	DC6210 A4 M54	689	RU
1	Set Door Seals	S88D x Head & Jambs		PE

HW SET # 2.0 - Doors: C350A, C350B

6	Hinge	T4A3386 x NRP	US32D	MK	087100
1	Electric Hinge	T4A3386 x QC	US32D	MK	087100
1	Keyed Removable Mullion	CR900BKM		RU	087100
1	Elect Rim Exit Device	ED5200S VT957 M92 MELR M54	630	RU	NOTE
1	Rim Exit Device	ED5200S EO M54 M52	630	RU	087100
3	Cylinder	AS REQUIRED x CT6	626	RU	087100
3	Permanent Core	AS REQUIRED	626	RU	087100
2	Door Closer	DC6210 A11 M54 x BRKTS REQ	689	RU	087100
1	Threshold	171A		PE	087100
1	Set Weatherstrip	BY DOOR MANUFACTURER		OT	084113
1	Mullion Gasketing	5110BL		PE	087100
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK	087100
1	ElectroLynx Harness	QC-C000P x LAR		MK	087100
1	Card Reader	FURNISHED IN OTHER SECTION		OT	NOTE 1
1	Door Position Switch	DPS-M-BK		SU	087100
1	Power Supply	BPS AS REQUIRED		SU	NOTE 1
1	Wiring Diagram	WD-SYSPK		RU	NOTE 1

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BAR IS HELD IN THE DOGGED POSITION BY THE ACCESS CONTROL SYSTEM. WHEN LOCKED,

PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

NOTE 1: ACCESS CONTROL HARDWARE LISTED ABOVE ARE TO BE FURNISHED BY THE G.C. UNDER SEPARATE SUBCONTRACTORACCESS CONTROL SYSTEM INTEGRATOR. ACCESS CONTROL SYSTEM TO BE INTEGRATED WITH EXISTING MIDDLE SCHOOL ON SITE.

NOTE 2: ONLY ONE DOOR PULL TO BE PROVIDE FOR DOOR PAIR. NO EXTERIOR HARDWARE TO BE PROVIDED FOR INACTIVE LEAF.

HW SET # 3.0 - Doors: C354A, C354B
Description: Exterior Aluminum Card Access Exit Pair - Keyed Mullion

1 Continuous Hinge (aluminum)	CFM__SLF-HD1 PT x Door Height		PE
1 Continuous Hinge (aluminum)	CFM__SLF HD1 x Door Height		PE
1 Electric Power Transfer	EL-CEPT By Div 28 Sub	630	SU
1 Mullion	CR907BKM CT6R x Opening Height		RU
1 Rim Exit Device, Exit Only,ELR,RX	ED5200 EO M54 M92 MELR	630	RU
1 Rim Exit Device, Exit Only	ED5200 EO M54 M52	630	RU
2 Interchangeable Core	CR8000- as Required	626	RU
1 Cylinder	CR3080-178 CT6R	626	RU
1 Anti-Vandal Pull	1097HA SP-MOUNT	630	TC
2 Surface Closer	DC6210 A3 M54 M75	689	RU
1 Threshold	171AK x Opening Width		PE
1 Mullion Gasketing	5110BL x Opening Height		PE
1 Rain Guard	346C x L A R		PE
2 Sweep	315CN x Door Width		PE
1 ElectroLynx Harness	QC-C012		MK
1 ElectroLynx Harness	QC-C1500P		MK
1 Wall Mounted Card Reader	Signo 40 By Div 28 Sub		HI
1 Power Supply	AQD2 Series as Req'd		SU

OPERATION: Card reader outside temporarily retracts latchbolt at active leaf- auto relock.
Device is fail-secure with inside RX switch and outside key override.
Inside pushbar always allows egress.

NOTE 1: MINIMUM 5" WIDE STILES REQUIRED AT ALUMINUM DOORS. PERIMETER GASKET BY FRAME MANUFACTURER. ACCESS CONTROL PANEL AND SECURITY SOFTWARE BY SECURITY CONTRACTOR. PREP DOOR AND HINGE JAMB FOR ELECTROMECHANICAL DEVICE.

NOTE 2: ONLY ONE DOOR PULL TO BE PROVIDE FOR DOOR PAIR. NO EXTERIOR HARDWARE TO BE PROVIDED FOR INACTIVE LEAF.

HW SET # 4.0 - Doors: C346

	Hinge	TA2714	US26D	MK	087100
1	Storeroom Lock	ML2057 LWA CT6	630	RU	087100
1	Permanent Core	AS REQUIRED	626	RU	087100
1	Door Closer	DC6210 A4 M54	689	RU	087100
1	Kick Plate	K1050 8" high CSK BEV	US32D	RO	087100
1	Set Sound Seals	332CR		PE	087100
1	Automatic Door Bottom	4131CRL		PE	087100

HW SET # 5.0 - Doors: C348

	Hinge	TA2714	US26D	MK	087100
2	Flush Bolt	555/557	US26D	RO	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Storeroom Lock	ML2057 LWA CT6	630	RU	087100
1	Permanent Core	AS REQUIRED	626	RU	087100
2	Overhead Holder	10-X26	630	RF	087100
2	Silencer	608		RO	087100

HW SET # 6.0 - Doors: C342A, C342B, C349, C355, C356, C359
Description: Classroom Function

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA CT6R	626	RU
1 Interchangeable Core	CR8000- as Required	626	RU
1 Wall Stop	406	US32D	RO
3 Silencer	608		RO

HW SET # 7.0 - Doors: B102A, B104B, C359, C360, C361
Description: Rated Storeroom Function

3 Hinge, Full Mortise	TA2714	US26D	MK
1 Storeroom Lock	ML2057 LWA CT6R	626	RU
1 Interchangeable Core	CR8000- as Required	626	RU
1 Door Closer	DC6200 M54	689	RU
1 Armor Plate	K1050 36" High	US32D	RO
1 Wall Stop	406	US32D	RO
1 Set Door Seals	S88D x Head & Jambs		PE

Notes: Mount closer on room side of door.

HW SET # 8.0 - Doors: F621D

2	Hinge	T4A3386 x NRP	US32D	MK	087100
1	Electric Hinge	T4A3386 x QC	US32D	MK	087100
1	Elect Rim Exit Device	ED5200S VT957 M92 MELR M54	630	RU	NOTE
1	Cylinder	AS REQUIRED x CT6	626	RU	087100
1	Permanent Core	AS REQUIRED	626	RU	087100
1	Door Closer	DC6210 A11 M54 x BRKTS REQ	689	RU	087100
1	Threshold	171A		PE	087100
1	Set Weatherstrip	BY DOOR MANUFACTURER		OT	084113
1	Mullion Gasketing	5110BL		PE	087100
1	ElectroLynx Harness	QC-C1500P (@ JAMB)		MK	087100
1	ElectroLynx Harness	QC-C000P x LAR		MK	087100
1	Card Reader	FURNISHED IN OTHER SECTION		OT	NOTE 1
1	Door Position Switch	DPS-M-BK		SU	087100
1	Power Supply	BPS AS REQUIRED		SU	NOTE 1
1	Wiring Diagram	WD-SYSPK		RU	NOTE 1

OPERATION: DOORS TO BE CLOSED AND LOCKED AT ALL TIMES UNLESS EXIT DEVICE PUSH BAR IS HELD IN THE DOGGED POSITION BY THE ACCESS CONTROL SYSTEM. WHEN LOCKED, PRESENTATION OF A VALID CARD SIGNAL ELECTRIC LATCH RETRACTION ALLOWING INGRESS. EGRESS AT ALL TIMES BY EXIT DEVICE PUSH BARS.

NOTE 1: ACCESS CONTROL HARDWARE LISTED ABOVE ARE TO BE FURNISHED BY THE G.C. UNDER SEPARATE SUBCONTRACTORACCESS CONTROL SYSTEM INTEGRATOR. ACCESS CONTROL SYSTEM TO BE INTEGRATED WITH EXISTING MIDDLE SCHOOL ON SITE.

HW SET # 9.0 - Doors: B206A, B206B, B221, B222

Description: Keyed Privacy Function + Occupancy Indicator

3	Hinge, Full Mortise	TA2314	US32D	MK
1	Institutional Privacy Lock + Indicators	ML2069 LWA M34 M19VN	626	RU
1	Overhead Stop	10-X36	630	RF
1	Mop Plate	K1050 6" High	US32D	RO

3	Silencer	608		RO	

HW SET # 10.0 - Doors: C350C

	Hinge	T4A3786	US26D	MK	087100
1	Keyed Removable Mullion	CR900BKM		RU	087100
1	Rim Exit Device	ED5200S TH957 M54 M52	630	RU	087100
1	Rim Exit Device	ED5200S TH950 M54 M52	630	RU	087100
4	Cylinder	AS REQUIRED x CT6	626	RU	087100
4	Permanent Core	AS REQUIRED	626	RU	087100
2	Door Closer	DC6210 A4 M54	689	RU	087100
2	Kick Plate	K1050 8" high CSK BEV	US32D	RO	087100
2	Silencer	608		RO	087100

HW SET # 11.0 - Doors: C345C, C345D, F621A, F621B, F621C
Description: Rated door pair on hold-opens, both doors active

6	EA	HINGE	TA2714 4.5 X 4.5	643	MCK
2	EA	FIRE EXIT HARDWARE	99-27L-F - 3' - LBR	619	VOM
2	EA	RIM CYLINDER	1109 "GA" KWY	613	YAL
2	EA	CLOSER	CLP8501 X SNB	695	NOR
1	SET	SEALS	S88D 20’	DKB	PEM
1	EA	GASKET	5110BL120	BLK	PEM
2	EA	MAGNETIC HOLDERS	1508-AQN5		EDS

OPERATION: DOORS TO BE HELD OPEN DURING NORMAL BUILDING OPERATION AND CLOSED AUTOMATICALLY UPON THE ACTIVATION OF THE FIRE ALARM SYSTEM.
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END OF SECTION 08 71 00

SECTION 088000 - GLAZING

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 for interior and exterior doors and borrowed lites.
2. Glazing sealants and accessories.

B. Related Requirements:

1. Section 081113 “Hollow Metal Doors and Frames.”
2. Section 081416 “Flush Wood Doors.”

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 according to ASTM C 1036.

C. IBC: 2021 International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

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. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12 inches (300 mm) lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and sealant testing agency.

B. Product Certificates: For glass.

C. Product Test Reports: For coated glass, insulating 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. Manufacturer Qualifications for Insulating-Glass Units with: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

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 C 1021 to conduct the testing indicated.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.

3. Test no fewer than Four Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.

4. Schedule enough time for testing and analyzing results to prevent delaying the Work.

5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to 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.

1.10 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.

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Manufacturers: Subject to compliance with requirements, provide glass units by Guardian Industries Corp.; SunGuard or compatible products by one of the following:
   a. Oldcastle BuildingEnvelope™.
   b. Pilkington North America.
   c. PPG Industries, Inc.

B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain glass from single source from single manufacturer.

C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

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 the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.

2. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.

3. 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.

D. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

E. 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. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to 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. GANA Publications: "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 or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 1/4 inch (6 mm).

E. 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 STANDARDS AND REFERENCES

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

2.5 MONOLITHIC GLASS

A. Glass Type "**G1**": Clear, annealed, fully tempered float glass.

1. Basis of Design Product: Guardian Clear by Guardian Glass.
2. Minimum Thickness: 1/4 inch (6 mm).
3. Safety glazing required (label all units).

B. Glass Type "**G2**": Gray-tinted, annealed, fully tempered float glass for insulating glass.

1. Basis of Design Product: Guardian Tinted Glass – Gray by Guardian Glass.
2. Minimum Thickness: 1/4 inch (6 mm).
3. Safety glazing required (label all units).
4. Performance Data:

a.	Visible light transmittance %:	45%
b.	Reflectance Out %:	6%
c.	Reflectance In %:	5%
d.	U-Value:	1.025 / 0.929 Btu/hr·ft²·F
e.	Shading Coefficient:	0.71
f.	Solar Heat Gain Coefficient:	0.62
g.	Light to Solar Gain:	0.73

2.6 INSULATING GLASS

A. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Glass Type:
   a. Outer Pane: G2, refer to monolithic glass types.
   b. Interspace Content: Air
   c. Inner Pane: G1, refer to monolithic glass types.
2. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
3. Spacer: Manufacturer's standard spacer material and construction.
4. Safety glazing required (label all units).
   a. Provide Tempered units as required by code and/or as noted in the drawings including at all doors, units adjacent to doors and units less than 24" a.f.f.

2.7 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. Field-applied sealants shall have a VOC content of not more than 250 g/L.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, 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. Dow Corning Corporation.
   b. Pecora Corporation.
   c. Tremco Incorporated.

2.8 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 C 1281 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 the 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.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of 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: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.10 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 according to 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 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 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 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 come into 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.

END OF SECTION 08 80 00

SECTION 09 22 16 - 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 gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, roof insulation system and grid systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI S202, "Code of Standard Practice for Cold-Formed Steel Structural Framing."

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
   b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
   b. Depth: As indicated on Drawings.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).

D. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal 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.

E. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
2. Depth: As indicated on Drawings.

F. 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 of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, 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 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, 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.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: 0.033 inch (0.84 mm).
3. Dimpled Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: 0.025 inch (0.64 mm).
4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
   a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Armstrong World Industries, Inc.; Drywall Grid Systems.
   b. Chicago Metallic Corporation; Drywall Grid System.
   c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

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 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 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.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

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 runner 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.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

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.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

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.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

5. Do not attach hangers to steel roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

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. High-Impact Interior Gypsum Board.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, thicknesses, finishes, joining, attachment devices, relationship of adjoining work and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement.

C. Samples: For the following products:

1. Aluminum Trim Accessories: Full-size Sample minimum 12-inch-long for each trim accessory indicated.

1.4 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.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, 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, those that are moisture damaged, and those that are 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. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Lafarge North America Inc.
2. National Gypsum Company.
3. USG Corporation.

B. Gypsum Board, Impact Resistant: ASTM C1658/C1658M. Locations: All locations U.N.O.
1. Thickness: 5/8 inch.
2. Long Edges: Tapered.
3. Soft-Body Impact: ASTM C1629/C1629M; Level 3.
4. Hard-Body Impact: ASTM C1629/C1629M; Level 2.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, 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.
e. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper or mesh

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. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.

b. Grabber Construction Products; Acoustical Sealant GSC.
c. Pecora Corporation; AC-20 FTR, AIS-919.
d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
e. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

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 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

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 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, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. 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-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch-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 C 919 and with manufacturer's written recommendations 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 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: Vertical surfaces unless otherwise indicated.

B. Single-Layer Application:

1. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

2. 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 or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING 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 where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings and per approved shop drawings.

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 C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Not Used.
3. Level 3: Not Used.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated, and at panel surfaces to receive wall coverings.
   a. Primer and its application to surfaces are specified in other Section 099123 "Interior Painting."
5. Level 5: Not Used.

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 09 29 00

SECTION 09 65 13 - 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. Resilient base.

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 long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

E. Product Schedule: For resilient base and accessory products.

1.4 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. Furnish 1% 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 or more than 90 deg F.

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time 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 or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER BASE, RB-1

1. Manufacturers: Subject to compliance with requirements, provide rubber base by Tarkett – Johnsonite Wall Base or, subject to compliance, products by one of the following:
2. Armstrong
3. Flexco.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style and Location:
   a. Type TP in Toe: Provide in all floor areas as scheduled

C. Thickness: 0.125 inch.

D. Height: 4 inches

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Field-Made

G. Inside Corners: Field-Made

H. Colors: 40 Black B

1. As selected by Architect from full range of industry colors.

2.2 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.

1. Adhesives shall have a VOC content of 50 g/L or less.

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 they are the same temperature as the 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. Field-Made Corners:
   1. Outside Corners:
      a. Stop application of adhesive to wall base approximately 18" (45cm) from the outside corner of the wall.
      b. Position the wall base at the corner and pencil line the back of the wall base where the bend is required.
      c. Lay the wall base on the floor with the backup. Utilizing a top-set or pull-type gouge tool, make a shallow notch along the pencil line.
      d. Note: The notch depth should not exceed one-quarter the total thickness of the wall base.
      e. Reposition the wall base corner on the wall. The corner of the wall should fit snugly into the notched recess on the back of the wall base.
      f. Apply adhesive and roll firmly into place.

   2. Inside Corners:
      a. Install wall base and terminate into the corner.
      b. Position another piece of wall base on opposing wall, without adhesive, approximately 1" from the installed piece.
      c. Utilize dividers; place one pin at the top of the installed piece and one pin at the top of the uninstalled piece. Carefully, move the dividers downward in a straight vertical motion, allowing the pin of the dividers to follow the profile of the installed piece. At the same time, place adequate pressure on the pin to transfer and/or scribe the profile onto the surface of the uninstalled piece.
      d. Use a utility knife to cut the scribe line on the uninstalled wall base, apply adhesive, and position the trimmed section into place.

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 exposed surfaces.
   2. Sweep and vacuum horizontal surfaces thoroughly.
   3. Damp-mop horizontal surfaces to remove marks and soil.

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 09 65 13

SECTION 09 91 13 - EXTERIOR PAINTING

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 exterior substrates:

1. Galvanized metal and steel.
2. Aluminum Plate

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. VOC content.

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. 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 specified in Part 3.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
   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 in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by Sherwin-Williams Company (The) or, subject to compliance, products by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Finishes, Inc.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect from manufacturer's full range and as indicated on drawings.

   a. PNT-3
      1) Color: **Fortitude**
      2) Code: **SW 9562**

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

   1. Sherwin Williams LX01W0200 Loxon Acrylic Block Surfacer

2.4 METAL PRIMERS

A. Primer, Metal, Steel and Galvanized, Water Based: MPI #134.

   1. Sherwin Williams B66W310 Pro-Industrial Pro-Cryl Universal Acrylic Primer.

2.5 WATER-BASED PAINTS

A. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss **Level 5**): MPI #153.

   1. Sherwin Williams B66W01151 Pro Industrial DTM Acrylic Semi-Gloss

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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. 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 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.

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. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer[**.**] but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. 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.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
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. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. 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.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view as determined by architect:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.

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 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Water-Based Light Industrial Coating System:
    a. Prime Coat: Primer, galvanized, water based, MPI #134.
    b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
    c. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 5), MPI #153.

B. Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
    a. Prime Coat: Primer, galvanized, water based, MPI #134.
    b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
    c. Topcoat: Light industrial coating, exterior, water based, gloss (Gloss Level 5), MPI #153.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

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. Brick Veneer.
2. Fiber Cement Panel.
3. Steel.
4. Galvanized metal.
5. Gypsum board.
6. Wood

B. Related Requirements:

1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

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 square.
2. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

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 specified in Part 3.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
   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.

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.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by Sherwin-Williams Company (The) or, subject to compliance, products by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Finishes, Inc.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

   1. Flat Paints and Coatings: 50 g/L.

   2. Nonflat Paints and Coatings: 150 g/L.

   3. Dry-Fog Coatings: 400 g/L.

   4. Primers, Sealers, and Undercoaters: 200 g/L.

   5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.

   6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.

   7. Pretreatment Wash Primers: 420 g/L.

   8. Floor Coatings: 100 g/L.

D. Colors: As selected by Architect from manufacturer's full range and as indicated on drawings.

a. PNT-1
1) Color: **Pure White**
2) Code: **SW 7005**

b. PNT-2
1) Color: **Unusual Gray**
2) Code: **SW 7059**

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI **#4**.

1. Sherwin Williams B25W25 PrepRite Block Filler Interior / Exterior Latex Block Filler

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: **MPI #50**.

1. Sherwin Williams B28W2600 ProMar 200 Zero VOC Interior Latex Primer

2.5 METAL PRIMERS

A. Primer, Metal, Steel and Galvanized, Water Based: MPI **#134**.

1. Sherwin Williams B66W310 Pro-Industrial Pro-Cryl Universal Acrylic Primer.

2.6 WATER-BASED PAINTS

A. Latex, Interior, Eg-Shel (Gloss Level 3): MPI **#52**

1. Sherwin Williams B20W12651 ProMar 200 Zero VOC Interior Latex Eg-Shel

B. Light Industrial Coating, Interior, Water Based, Eg-Shel (Gloss Level 3): MPI **#145**.

1. Sherwin Williams B66W01661 Pro Industrial Acrylic Eg-Shel

C. Pro Industrial Pre-catalyzed, Interior, Water Based Epoxy, Eg-Shel (Gloss Level 3): MPI **#151**.

1. Sherwin Williams K45W01151 Pro Industrial Pre-Catalyzed WB Eg-Shel Epoxy

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. Masonry (CMU): 12 percent.
3. Brick Veneer: 12 percent.
4. Fiber Cement Panel: 12 percent.
5. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. 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 Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry, Brick Veneer and Fiber Cement Panel Substrates: Remove efflorescence and chalk, repatch damaged existing surface. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer**.** but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. 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.

D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. 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.
2. 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. Brick Veneer Substrates:

1. Latex System:

a. Prime Coat: Block filler, latex, interior/exterior, MPI #4.

b. Intermediate Coat: Latex, interior, Water Based, matching topcoat.

c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.

B. CMU Substrates:

1. Latex System:

a. Block Filler: Block filler, latex, interior/exterior, MPI #4.

a. Intermediate Coat: Pro Industrial Pre-catalyzed, Water Based Epoxy, matching topcoat.

b. (2) Topcoats: Pro Industrial Pre-catalyzed, Water Based Epoxy, MPI #151

C. Fiber Cement Substrates:

1. Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.

b. Intermediate Coat: Latex, interior, Water Based, matching topcoat.

c. Topcoat: Latex, interior, Eg-Shel (Gloss Level 3), MPI #52.

D. Steel Substrates:

1. Pro Industrial Coating System:

a. Prime Coat: Pro-Industrial Pro-Cryl Universal Acrylic Primer, water based, MPI #134.

b. Intermediate Coat: Pro Industrial Acrylic Eg-Shel, water based, matching topcoat.

c. Topcoat: Pro Industrial Acrylic Eg-Shel, water based, MPI #145

E. Gypsum Board and Wood Substrates:

1. Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.

b. Intermediate: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, Eg-Shel (Gloss Level 3), MPI #52

END OF SECTION 09 91 23

SECTION 101100 - VISUAL DISPLAY SURFACES

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. Markerboards.

1.3 DEFINITIONS

A. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes markerboards

B. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of markerboards and tackboards.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.
2. Show locations of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.
4. **Include routing of surface mounted wire-mold around marker board installation locations.**

C. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, pre-fit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings 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.

B. Field Measurements: Verify actual dimensions of available wall space and construction contiguous with visual display surfaces by field measurements before fabrication.

1.10 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
    a. Surfaces lose original writing and erasing qualities.
    b. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.

1. Gloss Finish: Matte; dry-erase markers wipe clean with dry cloth or standard eraser.

B. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish.

C. Particleboard: ANSI A208.1, Grade M-1, made with binder containing no urea formaldehyde.

D. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and porcelain-enamel face sheet with Matte finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basis of Design: Claridge Products and Equipment, Inc. LCS Deluxe
   b. Marsh Industries, Inc.; Visual Products Group.
   c. Platinum Visual Systems; a division of ABC School Equipment, Inc.
   d. PolyVision Corporation; a Steelcase company.
2. Particleboard Core: 1/2 inch thick; with 0.015-inch-thick, aluminum sheet backing.
   a. Magnetic: Core material shall have magnet connectivity.
3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

2.3 MARKERBOARD ACCESSORIES

A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch-thick, extruded aluminum; slim size and standard shape.

1. Factory-Applied Trim: Manufacturer's standard.

B. Tack Strip: Manufacturer’s standard 2” high tack strip.

C. Chalktray: Manufacturer's standard, continuous.

1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

D. Flag Holder: 2” Aluminum hook clip flag holder mounted to tack strip rail, provide (1) one per marker board.

E. Hook with Clip: 2” Aluminum Hook with Clip mounted to tack strip, provide (2) two per marker board.

2.4 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

2. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

3. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.7 MARKERBOARD SCHEDULE

A. Visual Display Board – **MB1**: Factory assembled.

1. Markerboard: Porcelain-enamel markerboard assembly.
   a. Color: White.

2. Corners: Square.

3. Width: As indicated on Drawings or 6’-0” minimum if not noted in the drawings.

4. Height: As indicated on Drawings or 4’-0” minimum if not noted in the drawings.

5. Mounting: Wall.

6. Mounting Height: As indicated on Drawings or at height directed by the Architect.
7. Factory-Applied Aluminum Trim: Manufacturer's standard with clear anodic finish.
8. Accessories:
   a. Marker tray: Solid type.

B. Visual Display Board – **MB2**: Factory assembled.

1. Markerboard: Porcelain-enamel markerboard assembly.
   a. Color: White.
2. Corners: Square.
3. Width: As indicated on Drawings or 4’-0” minimum if not noted in the drawings.
4. Height: As indicated on Drawings or 4’-0” minimum if not noted in the drawings.
5. Mounting: Wall.
6. Mounting Height: As indicated on Drawings or at height directed by the Architect.
7. Factory-Applied Aluminum Trim: Manufacturer's standard with clear anodic finish.
8. Accessories:
   a. Marker tray: Solid type.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height: 28” inches above finished floor to top of marker tray or as directed by the Architect, and coordinating with the owner regarding the height before installation.

3.4 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches o.c. Secure both top and bottom of boards to walls.

3.5 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 10 11 00

SECTION 101423.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

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. Room-identification signs that are directly attached at the interior and exterior of the building.
   2. Exterior Vinyl Number Signs

1.3 ALLOWANCES

A. Allowances for signage are specified in Section 012100 "Allowances."

1.4 DEFINITIONS

A. Accessible: In accordance with the accessibility standard.

1.5 COORDINATION

A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For room-identification signs.
   1. Include fabrication and installation details and attachments to other work.
   2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
   3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Room-Identification Signs: Full-size Sample.
2. Variable Component Materials: Full-size Sample of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
3. Exposed Accessories: Full-size Sample of each accessory type.
4. Full-size Samples, if approved, will be returned to Contractor for use in Project.

E. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of finishes beyond normal weathering.
   b. Deterioration of embedded graphic image.
   c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five 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", the ABA standards of the Federal agency having jurisdiction and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign: with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

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. Advance Corporation.
   b. Best Sign Systems, Inc.
   c. Fastsigns
   d. Signarama

2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic backing sheet to produce composite sheet.
   a. Composite-Sheet Thickness: 0.125 inch (3.18 mm) and / or 0.25 inch (6.35 mm).
   b. Subsurface Graphics: Reverse halftone or dot-screen image.
   c. Color(s): As selected by Architect from manufacturer's full range.

3. Sign-Panel Perimeter: Finish edges smooth.
   a. Edge Condition: TBD
   b. Corner Condition in Elevation: TBD

4. Mounting: Surface mounted to wall with adhesive.

5. Text and Typeface: Accessible raised characters and Braille typeface as selected by Architect from manufacturer's full range and variable content as scheduled.

2.3 EXTERIOR VINYL NUMBER SIGNS

A. Locations: All exterior doors as indicated on Sheet A1.00 - Overall Reference Plan
B. Start number sequence from existing main building entrance door to all other existing exterior doors in a plan-clockwise array at each door; with numerical characters.

1. Label all exterior door openings that lead into the building with vinyl graphic to designate numbered entry system for first responders.
   a. Mounting: At doors without lites, surface mounted to exterior side of door with adhesive.
   b. Size: 10” tall

2. Label all exterior door openings that lead into the building with vinyl graphic to designate numbered entry system for first responders
   a. Mounting: At doors without lites, surface mounted to interior side of door with adhesive.
   b. Size: 10” tall

2.4 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).

D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings and suitable for exterior applications.

E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish nonferrous-metal devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:
   a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
   b. Fastener Heads: Use oval countersunk screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.
4. Room Sign Mounting Fasteners:
   a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
   b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

2.6 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly

mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.

2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

2.7 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, 0.018 mm or thicker.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Accessibility: Install signs in locations on walls according to the accessibility standard.

C. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.2 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.3 SIGNAGE SCHEDULE

A. The Manufacturer shall be responsible for developing the room signage schedule with the Owner / Architect.
   1. Signage shall be provided for all new spaces and all existing rooms within the scope.
   2. All codes required signs to be provided for exit doors.

END OF SECTION 10 14 23.16

SECTION 10 41 90 - DIMENSIONAL LETTER SIGNAGE

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. Cast dimensional characters.

1.3 DEFINITIONS

A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.4 COORDINATION

A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For dimensional letter signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.

1. Include representative Samples of available typestyles and graphic symbols.

D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:

1. Dimensional Characters: Full-size Sample of each type of dimensional character.
2. Exposed Accessories: Full-size Sample of each accessory type.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For signs to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of finishes beyond normal weathering.
   b. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL LETTER SIGNS, GENERAL

A. The Dimensional letter signs associated with this section are including the full scope of work described herein. The base bid shall include the construction of the exterior wall at the signage locations with no additional work.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Impact Architectural Signs
2. Gemini Incorporated
3. ASI Signage
4. Signarama
5. Or approved equal.

B. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, as follows:

1. Character Material: Flat Cut Aluminum.
2. Character Height: 24” High Letters
3. Thickness: 3/4” thick letters
4. Finishes:
   a. Painted Finish: Manufacturer's standard stock paint finish in color as selected by Architect from manufacturer's full range.
5. Mounting: Standoffs studs.
6. Typeface: To verified by the Owner
   a. from custom colors.
7. Mounting: Concealed mounting

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:

1. Use concealed fasteners and anchors unless indicated to be exposed.
2. For exterior exposure, furnish stainless-steel devices unless otherwise indicated.
3. Exposed Metal-Fastener Components, General:
   a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
   b. Fastener Heads: For nonstructural connections, use flathead screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.
4. Sign Mounting Fasteners:
   a. Standoffs Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
   b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.

B. Adhesives: As recommended by sign manufacturer and with a VOC content of 70g/L or less for adhesives used inside the weatherproofing system and applied on-site when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Adhesives: As recommended by sign manufacturer and that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.

1. Stainless-Steel Brackets: Factory finish brackets to match sign background finish unless otherwise indicated.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.6 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color as selected by the architect from the full range available from the manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that electrical service is correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
   a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
   b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position so that signage is correctly located and aligned.
4. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
5. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support

weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

3.4 DIMENSIONAL LETTERING SCHEDULE

A. Refer to the exterior elevations for dimensional lettering requirements

1. The Owner shall confirm the exact verbiage of all exterior dimensional lettering and signage.
2. The contractor shall provide a signage schedule for review and approval of the Owner and Architect

END OF SECTION 10 41 90

SECTION 10 52 20 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Fire extinguishers.

3. Mounting brackets.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified. For fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

2. Where color selections by Architect are required, include color charts showing full range of manufacturer’s standard colors and designs available.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain fire extinguishers, cabinets, and brackets from one source from a single manufacturer.

B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL “Listing Mark” for type, rating, and classification of extinguisher indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. J.L. Industries.
2. Larsen’s

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard, which comply with requirements of governing authorities.

1. Abbreviations indicated below identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.

B. Extinguishers: Provide equivalent to the following, from one of the above manufacturers.

1. Multi-purpose Dry Chemical Type: Rechargeable, UL-rated **2-A:40-B:C**, in enameled steel container.

2. Mounted on wall bracket, unless otherwise indicated on the Drawings.

C. Provide tag for each fire extinguisher, which identifies the unit, indicates date charged, and other pertinent data required by authorities having jurisdiction.

2.3 MOUNTING BRACKETS

A. Provide brackets designed to prevent accidental dislodgement of extinguishers, of sizes required for type and capacity of extinguisher indicated, in manufacturer's standard plated finish: Provide brackets for extinguishers not located in cabinets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

B. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

C. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions, and mounting heights as follows:

1. Fire Extinguisher Mounting Brackets: 44" A.F.F. to horizontal centerline of bracket release mechanism.
   a. Comply with ICC A117.1-2017 for mounting height for accessibility.

D. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by Architect.

E. Install one fire extinguisher on each bracket.

END OF SECTION 10 52 20

SECTION 105610 – WOOD STORAGE SHELVING

PART 1.0 GENERAL

1.1 DESCRIPTION

A. Work Included: Install pre-manufactured wood storage shelving and other items not specifically described as being installed under other Sections of these Specifications.

1.2 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings for storage units, identified with location, materials and finishes.
2. Indicate materials, methods of assembly and jointing, thickness of parts, location and type of hardware.
3. Take measurements at the site for space where each item is to be placed.

B. Product Data: Submit manufacturer's detailed product description. Indicate unit construction including finishes.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver storage units only after building is enclosed and wet operations in building are completed.

B. Protect finished surfaces from soiling and damage during handling and installation.

PART 2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design Product: Products provided by the following manufacturers are acceptable:

1. Excalibur Shelving Systems, Standard Pine
2. Palmetto Shelving Systems, Inc.

2.2 MATERIALS AND COMPONENTS

A. Uprights: Premium Grade Western Hemlock (1-1/2" x 1-5/16")

1. 3/8" x 5/8" deep plow entire length of stiles to receive shelf end channels with 3/16" drilled holes on 1" centers.
2. Stiles are to be locked together with three or more cross members mortised glued and pinned into the stiles
3. All components are to be machined smooth with all outside corners eased

4. Uprights to be 84”H unless otherwise noted by plans.

A. Shelves: 3/4" pine shelf materials are to be machined to accept roll formed steel end channels shaped to fit over each end of the shelf and to rest on the shelf support pins. Finger joints are not acceptable.

1. Seven (7) shelves per section unless otherwise indicated on plans

C. Shelf Support Pins: Non rusting alloy, 3/16" diameter x 1-14" long, 5/16" diameter head.

D. "X" Braces: Two 18 gauge galvanized 3/4" steel straps with holes punched at each end. Rivet straps at centers. Provide as manufacturer recommends for stability.

E. Back Panels: All back-to-back units for book storage to have 1/8" Abitibi S2S tempered hardboard back panels.

F. Kickboard: Provide a continuous prefinished 4" pine kickboard for each elevation.

G. Finish: Shelving up to 28” D shall have a UV Finish, shelving deeper than 28” D shall be factory seal and lacquer (site finish is not acceptable)

2.3 FABRICATION

A. Manufacture shelving in sizes as necessary to fit wall-to-wall as indicated on the drawings. Gaps in excess of 2" are not acceptable.

B. Where dead corners are indicated on drawings, solid end panels will be required.

C. Shelves shall not exceed 42" in length in general storage areas and 36" in book storage rooms. Shelves with inset end supports and/or less than 3/4" thick must be pre-approved (sample required) and may not exceed 30" in length.

D. Modifications for shelves with inset end supports must be performed by the manufacturer. Field modifications will not be accepted.

PART 3.0 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. All overhead work including functional lights, flooring including cove base and final coat of paint must be complete prior to installation of shelving.

3.2 INSTALLATION

A. Install in strict accordance with manufacturer's current instructions and approved shop drawings.

B. Anchor all wall units.

C. Provide signage noting that storage is prohibited within 18” of the ceiling.

END OF SECTION

SECTION 10 56 13 – METAL STORAGE SHELVING

PART 1.0 GENERAL

1.1 DESCRIPTION

A. Work Included: Install pre-manufactured metal storage shelving and other items not specifically described as being installed under other Sections of these Specifications.

1.2 SUBMITTALS

A. Shop Drawings:

1. Submit shop drawings for storage units, identified with location, materials and finishes.
2. Indicate materials of shelving and deck, methods of assembly and jointing, thickness of parts, location and type of hardware.
3. Take measurements at the site for space where each item is to be placed.

B. Product Data: Submit manufacturer's detailed product description. Indicate unit construction including finishes.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver storage units only after building is enclosed and wet operations in building are completed.

B. Protect finished surfaces from soiling and damage during handling and installation.

PART 2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design Product: Heavy-duty shelves and deck by Global Industrial, and products provided by the following manufacturers are acceptable:

1. ULINE
2. Grainger

2.2 MATERIALS AND COMPONENTS

A. Shelves, Basis of Design Product: Model WB601714 by Global Industrial.

1. Design: Gravity lock type consisting of upright frames, beams designed to be assembled without fasteners or clips. All welded construction.
2. Finish: Chip resistant Gray baked enamel finish.
3. Dimensions: 72”W x 48” D x 84” H.

4. Shelf Capacity: 1195 lbs min.

B. Melamine Deck, Basis of Design Product: Model WB331773A by Global Industrial.
   1. Core: Industrial-grade particle board (45-50 lb/ft³ density).
   2. Surface: Thermally-fused melamine laminate, both sides.
   3. Thickness: 1/2 inches minimum.
   4. Dimensions: 36”W x 48”D, two pieces for each level of shelving unit.
   5. Edge: Sealed or banded for safety and moisture protection.
   6. Load capacity: 650 lbs min.

2.3 FABRICATION

A. General: Coordinate fabrication and delivery ensure no delay in progress of work.

PART 3.0 EXECUTION

3.1 EXAMINATION

A. Examine pallet rack sections to receive accessories (if applicable) for compliance with requirements for installation tolerances and other conditions affecting performance of specified accessory items.

B. Verify that installation locations of units will not interfere with or block established required exit paths or similar means of egress once units are installed.

C. Proceed with accessory installation, if applicable, only after unsatisfactory conditions have been corrected.

3.2 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. All overhead work including functional lights, flooring including cove base and final coat of paint must be complete prior to installation of shelving.

3.3 INSTALLATION

A. Follow manufacturer’s written instructions for installation of each type of accessory item specified, if applicable.

END OF SECTION 10 56 13

SECTION 21 05 00 - GENERAL FIRE SUPPRESSION REQUIREMENTS

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.

B. Section 078413 Penetration Firestopping.

C. All sections of Division 21 specifications apply to this section.

1.2 SUMMARY

A. The Fire Protection Work shall include, but not be limited to, the following:

1. Connection to the above ground existing dry and wet sprinkler piping located in the existing fire pump room.
2. Alarm valves and risers.
3. Drain connections.
4. Pipe hangers and supports.
5. Seismic supports.
6. Water piping, sprinkler heads, and valves.
7. Submittals.
8. All other work and materials specified herein or shown on drawings.
9. Design, installation, and testing of the automatic sprinkler system to provide coverage as indicated on the contract documents. The installation of the sprinkler system shall conform to NFPA 13 (2019 edition). The system shall be hydraulically calculated by the Contractor.
10. Securing permits and inspections.

1.3 DELINEATION OF WORK

A. Provide all necessary supervision and coordination of information to installers who are performing work to accommodate Division 21 installations.

B. Where the Division 21 installer is required to install items that they do not purchase, they shall include such items:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven into 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 necessary for their proper operation.

6. Their mounting in place includes 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 includes the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Items that are to be installed by the Division 21 installer but not purchased as part of the work of Division 21 shall be carefully examined upon delivery to the project. The Division 21 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 Architect/Engineer 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 Architect/Engineer.

1.4 QUALITY CONTROL

A. Qualifications of Installer:

1. The systems shall be installed by a licensed fire protection contractor or contracting firm regularly engaged in the installation of fire protection systems. The Architect/Engineer may require evidence to support the above requirements and may reject any proposed contractor who cannot show suitable experience.
2. The Contractor must be certified as a NICET Level III for fire sprinkler systems and shall submit data showing the same.
3. The Contractor shall furnish evidence that there is an experienced and effective service organization that carries a stock of repair parts for the system to be furnished. Should the Contractor fail to comply with the service requirements of this Section, the Owner or his Representative will then have the option to make the necessary repairs and back-charge the Contractor without any loss of warranty as provided by the Contract Documents.

B. Equipment and Materials:

1. All equipment and materials required for installation under these specifications shall be new and unused, of the best grade and quality, shall be of the latest design of the manufacturer, and shall be listed as approved by U.L. All components shall be suitable for the pressures to be encountered.
2. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment for 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.
3. All equipment, materials, and work is intended to be installed in a manner conforming to the best engineering practice and all equipment is intended to be complete in every respect to satisfy the job requirements and/or this specification.
4. 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.
5. All materials with a manufacturer's listed shelf life shall be used at least six months before the expiration of the materials' shelf life.

C. Criteria:

1. Installation of the systems and all the work covered by these specifications shall conform in strict accordance to all codes, ordinances, and regulations of the City, County, State, National Fire Protection Association (NFPA), and/or all other authorities having jurisdiction. Also, the work covered by these specifications shall be provided in strict accordance with all requirements and recommendations of the National Fire Protection Association, and the insurance underwriter. All material and work necessary to meet these requirements shall be so indicated on the shop drawings and shall be installed at no extra cost to the Owner.

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 unless noted otherwise):

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)

1.6 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 Architect/Engineer 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 Architect/Engineer 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 before the bid opening date to the Architect/Engineer. 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 as concise, clear, and brief as possible. Incomplete submittals or submittals requiring lengthy research to ascertain quality will not be considered.

C. Approval of the Architect/Engineer 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 before the bid opening date.

D. Items approved shall not be construed as authorizing any deviations from the plans and specifications unless such deviations are 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 Architect/Engineer, 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 impacts 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.

1.7 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 Architect/Engineer 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.

1.8 ELECTRICAL CHARACTERISTICS FOR FIRE SUPPRESSIONS EQUIPMENT

A. Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements. 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.

1.9 WORKMANSHIP

A. Workmen shall be thoroughly experienced and fully capable of installing the work. Work shall be per the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to the Owner.

B. All materials and equipment are to be installed per the manufacturer's printed recommendations using recommended accessories. Retain a copy on the job site and submit others for approval when required.

1.10 WARRANTIES

A. General:

1. Furnish to the Architect/Engineer a warranty form 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 warranty 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 warranty 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. Non-Warranted Items:

1. Nondurable replaceable items do not require replacement after the date of acceptance.

E. 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 the Owner.

2. The determination of the impact on the facility is solely that of the Owner and Architect/Engineer.
3. Where life safety issues are impacted, the contractor shall take all steps necessary to ensure the facility can continue to function safely.
4. If repairs cannot be made in the required period, temporary systems shall be installed until repairs can be completed.
5. All costs associated with warranty work shall be borne by the contractor.

1.11 EXISTING FACILITIES

A. The location of pipes, sprinklers, valving, equipment, and appurtenances for existing facilities are shown on plans to indicate the extent of work required. The 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. Before 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 Architect/Engineer before installation of any equipment or system component.

3.2 JOB CONDITIONS

A. Where work requires interruption of existing public utility service, obtain written permission from the affected utility company for the interruption.

B. Where work requires interruption of the Owner's existing utility service, schedule interruption with the Owner. Notify the Owner and Architect/Engineer at least 48 hours before the scheduled interruption.

3.3 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 per Codes, contract documents, manufacturer's recommendations, and accepted practices notify the Architect/Engineer in writing before installation of equipment.

C. If any system component cannot be installed per Codes, contract documents, and accepted practices, notify the Architect/Engineer in writing before installation of the system component.

3.4 LEAK DAMAGE

A. This Contractor shall be responsible during the installation and testing periods of the sprinkler system for any damage to the work of others, to the building or its contents, or the site, etc., caused by leaks in any equipment, by unplugged or disconnected pipes, fittings, etc., or by overflow and shall pay for necessary replacement or repairs to work of others, buildings, sites, merchandise damage or furniture and equipment by such leakage.

3.5 HOSE THREADS

A. Hose threads shall conform to the standards of the local fire department. The Contractor shall verify the exact threads used before ordering materials.

3.6 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 before final inspections, repair or replace damaged items as determined by the Architect/Engineer, 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 all pipes, equipment, etc. which could collect construction debris shall be properly capped.

3.7 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 them back to a "like new" condition. All costs shall be borne by the Contractor.

C. All extraneous materials shall be removed on the site regularly to provide access to all work as well as a safe working environment.

END OF SECTION

SECTION 21 05 01 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Sleeves
2. Escutcheons
3. Fire-suppression equipment and piping demolition
4. Equipment installation requirements common to equipment sections
5. Painting and finishing
6. Supports and anchorages

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Escutcheons

1.5 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in the building structure during the progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 SLEEVES

A. General:

1. Provide sleeves for each pipe passing through walls, partitions, floors, and roofs unless specific details indicate otherwise.
2. Provide sleeves where required by UL firestop assembly selected. Sleeve size, length, and type shall be equal to that required for the UL firestop assembly utilized.
3. Do not provide a sleeve when not permitted by UL firestop assembly selected.
4. Core drilled holes in concrete walls do not require sleeves unless required by UL firestop assembly where applicable.

B. Type:

1. Sleeves in non-masonry or concrete construction shall be a minimum of 24-gauge sheet metal.
2. Sleeves in masonry or concrete construction shall be Schedule 40 black or galvanized steel.
3. Sleeves in the membrane or waterproof construction shall have a 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 piping (insulated and uninsulated) shall have annular space as required by NFPA 13.

D. Sleeve Length:

1. Sleeves shall be equal to the thickness of constructions and terminated flush with surfaces.

E. Sleeve Packing:

1. Sleeves shall be packed as follows:
   a. As indicated in detail or fire-stopping specification.
   b. If not indicated otherwise, seal the entire sleeve at the exterior wall/floor with a flexible elastomeric or silicone caulk.

F. Fire-Rated Assemblies:

1. Provide a sleeve where required by UL firestop assembly utilized.
2. Do not provide a sleeve if not permitted by UL firestop assembly utilized.

2.3 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an internal diameter to closely fit around the pipe, tube, and insulation of insulated piping and an outside diameter that completely covers the opening.

B. General:

1. Escutcheons shall be chrome-plated brass.
2. Escutcheons shall be held in place by the internal spring tension of set screws.

2.4 SPRINKLER GUARDS AND WATER SHIELDS

A. Sprinkler Guards:

1. Provide guards for sprinklers located within 7 feet of the finished floor or wherever sprinklers may be subject to mechanical damage.
2. Sprinkler guards shall be “Thread Guard” with a white powder coat finish manufactured by SprinkGUARD. The sprinkler shall be UL listed for use with fire sprinkler guards as manufactured by SprinkGUARD.
3. Sprinkler guards shall be listed for use with the proposed sprinkler.

PART 3 - EXECUTION

3.1 FIRE-SUPPRESSION DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove fire-suppression systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove the portion of piping indicated to be removed and cap or plug the remaining piping with the same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with the same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.

4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If the pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace them with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 21 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate the general location and arrangement of piping systems.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes or as required by NFPA13.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow the application of insulation.

K. Select system components with a pressure rating equal to or greater than the system operating pressure.

L. Install escutcheons for all exposed piping penetrations of walls, ceilings, and floors except in unoccupied equipment rooms (i.e., fire pump/riser rooms, mechanical rooms, etc.)

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide annular clear space between the sleeve and pipe or pipe insulation as required for seismic conditions per IBC and NFPA 13 and per Fire Barrier penetration requirements.

N. Aboveground interior and exterior wall penetrations: Seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for the size, depth, and location of the joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

O. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for additional information.

P. Verify final equipment locations for roughing-in.

Q. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PAINTING

A. Painting of fire-suppression systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match the original factory finish.

END OF SECTION

SECTION 21 05 03 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. Refer to Division 01 Section "Execution" and Division 02 Section "Selective Demolition" for general demolition requirements and procedures.

C. All sections of Division 21 Specifications apply to this section.

1.2 SUMMARY

A. General:

1. Furnish all labor, materials, tools, and equipment and perform all operations in connection with the demolition of all Fire Protection equipment, piping, sprinklers, 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 the building structure, finishes, and building assemblies as specified hereinafter.
3. All existing utilities, water, controls, etc. shall be reconnected to new systems as required to maintain the same functions as existed before new work.
4. Maintain fire protection facilities in service during selective demolition operations.

B. Descriptions:

1. Cut openings thru the existing building walls, roof, floors, and finishes to accommodate the installation of Division 21 equipment, controls, piping, and appurtenances.
2. Remove and dispose of existing Fire Protection 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 following 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.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

A. Post-tensioned slabs, beams, columns, and other load-bearing structures shall not be drilled, cut, or otherwise modified without written approval by the structural engineer.

3.2 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 that 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.

3.3 COORDINATION

A. All demolition work shall be coordinated with the Owner. Work that 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 outside the Owner's normal working hours.

3.4 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 or duct unless required due to seismic requirements.

3.5 MATERIAL REMOVAL

A. The Owner shall retain the first right of refusal on all existing equipment, piping, and appurtenances that are to be removed as a result of this contract.

B. Coordinate demolition work with the Owner using extreme care not to damage existing equipment which Owner elects to retain.

C. Remove Owner retained equipment from the existing location and store equipment at a location on the site where specified by the Owner.

D. All material, equipment, supports, and appurtenances not required as the result of demolition or renovation of the building systems shall be removed from the project site and disposed of properly unless retained by the Owner.

END OF SECTION

SECTION 21 05 10 - DOCUMENTATION AND CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

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 21 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 Architect/Engineer in triplicate unless additional copies are noted.

B. Reports, 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 and shall be certified by the equipment or system manufacturer.

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, materials, and equipment on the project job drawings.

B. As built drawings shall have the information transferred from the project job drawings including all addenda, supplemental instructions, change orders, and similar information.

C. Qualified draftsmen shall perform this task.

D. SPRINKLER SUPPRESSION SYSTEM DOCUMENTS CABINET:

1. Provide a heavy-duty red-hinged cabinet with a locking door installed in the Sprinkler Riser/Fire Pump Room.
2. The cabinet shall be a surface-type enclosure constructed of 16 gauge cold rolled steel and shall be finished with a durable red textured, heat-resistant baked-on enamel finish.
3. The cabinet door shall have a stainless steel piano hinge and a high-security CAT 30 keyed door lock.
4. The front cover shall include a durable label displaying “SPRINKLER SUPPRESSION SYSTEM DOCUMENTS” in 1” white indelible lettering, applied to the cover relative to the orientation of the installed back box.
5. The documentation cabinet shall be sized to include all necessary documentation which shall include, as a minimum:
   a. Approved submittal drawings/as-built drawings
   b. Copy of the currently adopted edition of NFPA 25
   c. Fully executed Contractor’s Material and Test Certificate for Aboveground Piping and Underground Piping as applicable
   d. Backflow preventer test certificate as applicable
6. Cabinet shall be equal to DBX As Built Drawing Cabinet as manufactured by Space Age Electronics model #SSU00677 (26-1/4” W x 14-1/4” H x 4” D), minimum size with lettering as specified above.

E. Provide a compact disc with computer-generated plans of the Contractor’s submittal/as-built drawings in Portable Document Format (PDF).

3.4 OPERATING AND MAINTENANCE MANUALS

A. Compile and bind three (3) sets of all manufacturers’ instructions and descriptive literature on all items of equipment furnished under this work. Additionally, provide this information on a CD in PDF format. PDF shall be book marked to identify all equipment.

B. The binder shall be a hardcover, 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 front of the binder shall be titled "Fire Suppression Operating and Maintenance Instructions," with the name of the job and documents date under the title.

D. Where laminated documents are required, only one set shall be provided.

E. Operating and Maintenance Instructions shall include the following:

1. Cover sheet in each binder listing the architect, engineer, and all contractors. List addresses and phone numbers.

2. List the name, address, and phone number of the organization responsible for warranty work, if other than Contractor, and the specific work for which he is responsible.
3. List the 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, 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 marked or attached to this submittal.
8. NFPA-25 (2020 latest edition) "Inspection, Testing, and Maintenance of Water Based Fire Protection Systems."
9. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
10. Instruction Books: These may be standard booklets but shall be marked to indicate applicable equipment and characteristics.
11. Wiring Diagrams: Generalized diagrams are not acceptable; submittal shall be specifically prepared for this Project.

F. The following diagrams, schematics, and lists shall be laminated (8-1/2" x 11" or 11" x 17" as needed for clarity):

1. Valve diagrams of each sprinklered building indicating the locations of all control valves, low point drains, inspector tests, and air vent valves. The diagrams shall be neatly drawn and color-coded to indicate the portion of the building protected by each system.
2. Provide two copies – one to be kept in Operations and Maintenance Manual and one to be installed on the wall adjacent to the fire riser.

3.5 ENGINEERING FIELD REPORTS AND FINAL INSPECTION REPORTS

A. The Architect/Engineer 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. The 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. 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.

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 Architect/Engineer will visit the project for a demonstration of the building system and an inspection of the completed work.

B. Items that do not comply with the Contract Documents or that function incorrectly will be listed. The list will be provided by the Architect/Engineer to the Contractor for correction of the installed work.

C. After all corrections have been made, the Contractor shall notify the Architect/Engineer who will recheck the systems for compliance of all items listed.

PART 4 - STANDARD FORMS

4.1 GENERAL

A. All forms shall be filled out by the Contractor before acceptance of the project by the Architect/Engineer.

4.2 FIRE PROTECTION CLOSEOUT LIST

FIRE PROTECTION CLOSEOUT DOCUMENT
PROJECT: MTC AMSC CENTER ADDITION & RENOVATIONS
BGA PROJECT NO.: 24094

DOCUMENT	DATE REVIEWED	DATE RETURNED	COMMENTS
Fire Protection O&M Manual			
Contractor As-Built Submittal Drawings – Printed (1 set minimum)			
Contractor As-Built Submittal Drawings/Holder Located in Riser Room (1 set per Riser room)			
Contractor As-Built Submittal Compact Disc PDF Format			
NFPA 13 and 24 Contractor's Material and Test Certificate for Aboveground Piping			
Valve diagrams (laminated)			
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 FIRE PROTECTION INSTRUCTIONS TO OWNER

FIRE PROTECTION INSTRUCTIONS TO OWNER

PROJECT: MTC AMSC CENTER ADDITION & RENOVATIONS

BGA PROJECT NO.: 24094

INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Fire Suppression Systems		4			
Vapor Phase Corrosion Inhibitor System		2			

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.

4.4 FIRE PROTECTION SPARE MATERIALS

FIRE PROTECTION SPARE MATERIALS LIST
PROJECT: MTC AMSC CENTER ADDITION & RENOVATIONS
BGA PROJECT NO.: 24094

ITEM	DATE DELIVERED	ACCEPTED BY	COPY OF RECEIPT SENT TO BGA
Spare Sprinklers			

NOTE: Not all spare materials may be listed. See other sections of specifications for additional requirements.

END OF SECTION

SECTION 21 05 11 - SUBMITTALS

PART 1 - GENERAL

1.1 GENERAL

A. Refer to Division 1 specification for information and shop drawings and submittals requirements. When conflicts exist, 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 21 specifications apply to this section.

1.3 PREPARATION OF SUBMITTALS

A. Before preparing submittals, consult all contract drawings and specifications in detail, obtain the 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 them to the Architect/Engineer.

1.4 SUBMITTALS

A. General:

1. Submittals are required on all items of equipment.
2. Submittals shall include, but not be limited to:
    a. All requirements of Division 1.
    b. Complete information about 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 identified.
    e. External connections are 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.

1.5 REVIEW OF SUBMITTALS

A. Review of submittals 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 per the equipment shown on the schedule shall be of the size and physical arrangement to allow unobstructed access, when installed, for routine maintenance, motor removal, and other similar operations. Deviation from the characteristics of that equipment or layout system components will not necessarily be cause for rejection.

C. A review of the 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 Architect/Engineer to modify or replace equipment or system components with all costs, direct and indirect, borne by the Contractor.

D. It is strongly recommended that the Contractor not purchase or install any equipment or system components before receipt of reviewed shop drawings.

E. 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.

F. Submittal documents shall be submitted for approval to the Architect/Engineer. Once approval has been obtained from the Architect/Engineer, the submittal shall be submitted to the Authority Having Jurisdiction and/or State Fire Marshal for final approval. Fire suppression system installation shall not begin until the Authority Having Jurisdiction and/or the State Fire Marshal's acceptance of submittal documents has been received.

1.6 EQUIPMENT DIMENSIONS AND WEIGHTS

A. The contract documents may indicate specific equipment dimensions. The Contractor is responsible for verification of the dimensions of the equipment submitted before submitting shop drawings. Equipment larger than the equipment indicated on the contract documents may not be acceptable to the Architect/Engineer.

B. The contract documents may indicate specific equipment weights. The Contractor is responsible for verification of the weight of the equipment submitted before submitting shop drawings. Equipment weighing more than the equipment indicated on the contract documents may not be acceptable to the Architect/Engineer.

C. If equipment is not acceptable to the Architect/Engineer 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 fire suppression equipment are indicated on the fire suppression documents. The electrical documents indicate power and wiring requirements for each piece of fire suppression equipment.

B. It shall be the fire suppression installer's responsibility to verify before submitting shop drawings that the equipment submitted meets the electrical requirements of both the fire suppression and electrical documents. If there is a discrepancy, the contractor shall bring the discrepancy to the Architect/Engineer's attention before submitting shop drawings.

C. If the discrepancy is brought to the Architect/Engineer's attention before ordering the fire suppression equipment or electrical materials associated with that equipment, the Architect/Engineer will issue additional instructions to the Contractor.

D. If the discrepancy is not brought to the Architect/Engineer's attention before ordering the fire suppression equipment and electrical materials (i.e., the 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 before ordering the fire suppression 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 Architect/Engineer. All products may not be listed.

Equipment and Pipe Identification
Escutcheons
Flexible Pipe Connections (sprinkler piping)
Hydraulic Calculations
List of Pipe and Fitting Material for Each System
Pipe Hangers and Supports
Pipe Sleeves
Seismic Products and Calculations
Sprinklers
Submittal Drawings (Pipe/Sprinkler Layout, Seismic Zone of Influence, etc.
Supervisory Devices
Thermometers and Gauges
Valves
Vapor Phase Corrosion Inhibitor System
Water Flow Alarm Devices

3.2 TEST AND REPORT SUBMITTALS

A. The following list may be used as a checklist for the Contractor and Architect/Engineer. All tests may not be listed.

1. Fire suppression piping

2. System start-up
3. Vapor Phase Corrosion Inhibitor System

3.3 SUBMITTAL DRAWINGS

A. This section may not include all drawings required. See specific specifications for additional requirements. All drawings shall be drawn 1/8" = 1'0" minimum. Fire Pump rooms shall be drawn 1/4” = 1’-0” minimum.

B. Review structural and architectural drawings to determine the method of attachment or support of pipe and equipment to slabs, walls, and other structural elements.

C. Provide dimensional drawings in the plan with all site utilities shown. Underground utilities shall have all inverts listed where work is to be performed within a municipality, approval shall be obtained from the proper authority before submitting shop drawings to Architect/Engineer.

D. When equipment is to be installed on supports provided by installers other than Division 21, the Division 21 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 supports.

E. Provide a complete reflected ceiling plan indicating the locations of each sprinkler in addition to other utilities (i.e., lights, diffusers/grilles, speakers, etc.) Provide additional sprinklers (over Code minimum quantities) if requested by the Architect, to obtain symmetrical layouts.

F. Provide a separate piping plan indicating seismic bracing locations, seismic zones of influence, flexible coupling locations, and all other seismic-related items.

3.4 SUBMITTAL DRAWINGS TO AUTHORITY HAVING JURISDICTION AND/OR STATE FIRE MARSHAL

A. At the time of submission to the Authority Having Jurisdiction and/or State Fire Marshal, Contractor shall provide an electronic copy in PDF format of the Fire Sprinkler Submittal Plans to Engineer.

3.5 SUBMITTAL COVER SHEET

A. A separate cover sheet shall be submitted with each product type (i.e., valves can be submitted together, etc.)

3.6 SUBMITTAL COVER SHEET

(Provide one page for each group of submittal documents.)

PROJECT NAME: MTC AMSC CENTER ADDITION & RENOVATIONS BGA FILE NO. 24094-6-33
OWNER PROJECT NO. _____ BGA SHOP DWG. NO. _____

PRODUCT: _____

NOTE TO CONTRACTOR

1. All submittal comments by Buford Goff & Associates shall be complied with or the submittals 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 submittals shall be declared rejected.

3. Sprinklers, 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 fire alarm components of the product been reviewed and do they meet with the requirements of the fire alarm 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. 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

SECTION 21 05 48 - SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 21 specifications apply to this section.

1.2 SUMMARY

A. This Section includes the following:

1. Restrained elastomeric isolation mounts
2. Restraining braces

1.3 DEFINITIONS

A. IBC: International Building Code

B. ICC-ES: ICC-Evaluation Service

C. NFPA: National Fire Prevention Association

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class and Seismic Design Category as Defined in the IBC: Obtain from architectural and/or structural drawings.
2. Assigned Seismic Occupancy Category as Defined in the IBC: Obtain from architectural and/or structural drawings.
    a. Component Importance Factor, Ip: 1.5
3. Mapped MCE Spectral Response Acceleration at Short Periods (0.2 second), Ss: 0.346,
4. Seismic coefficient, Cp, per NFPA 13: 0.36

1.5 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

3. Design calculations.

B. Submittal Drawings:

1. Submit drawings indicating the following items as a minimum:
   a. Zone of influence areas
   b. Flexible coupling locations
   c. Location of piping penetrating masonry walls and/or impact-resistant gypsum board indicating either flexible couplings or annular clearances per NFPA 13.
   d. 4-way bracing
   e. Restraint of the end of sprinkler lines and branch lines
   f. Restraining straps as required by NFPA 13

2. Submittal drawings shall be separate from fire sprinkler drawings and shall include minimal information needed from fire sprinkler drawings (i.e., sprinkler piping and sprinklers) to complete seismic drawings.

1.6 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC and NFPA 13 unless requirements in this Section are more stringent.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFCON; an ASC Engineered Solution
2. TOLCO Incorporated; a brand by EATON

B. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to the braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

2.2 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 7-16 (Chapter 13)
   c. American Concrete Institute (ACI) 318
   d. NFPA 13 (Chapter 18)

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. The following anchorage and attachments are not permitted:
   a. Powder-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.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. All hardware shall be electro-galvanized. Hot-dip galvanized metal components for exterior use.
2. Bolts shall be zinc coated for interior applications and stainless steel for exterior applications.
3. Seismic restraint devices shall have a hot dipped galvanized or stainless steel finish for exterior applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze members with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between the anchor and adjacent surface exceeds 0.125 inches.
2. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for the component.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127 and NFPA 13.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.

C. Install seismic-restraint devices using methods approved by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction providing required submittals for the component.

D. Attachment to Structure: If a specific attachment is not indicated, anchor bracing to the structure at flanges of beams, at upper truss chords of bar joists, or concrete members.

E. Drilled-in Anchors:

1. Identify the position of reinforcing steel and other embedded items before drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with the sleeve fully engaged in the structural element to which the anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust before installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid the introduction of air pockets in the adhesive.
5. Set anchors to the manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

END OF SECTION

SECTION 21 05 53 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 specification sections, apply to this section.

B. All sections of Division 21 specifications apply to this section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels
2. Miscellaneous signs and labels
3. Flexible Sprinkler Hose Fittings label
4. Stock of spare sprinklers sign
5. Sprinkler System General Information sign

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General:

1. Nameplates shall be black plastic with white engraved lettering.
2. All information shall be provided on a single nameplate per device if practical.

3. Nameplates shall have screw holes and screws for mounting unless screws would damage the intended use of the product to which it is attached (i.e., NEMA4 panel, etc.). In that case, provide stick-on nameplates.
4. Nameplates shall be 1/16" thick.

B. Size:

1. Three-quarter inch (3/4") high nameplate when located on ceiling grid.
2. Two-inch (2") high nameplate when located on fire protection equipment located either indoors or outdoors.
3. Three-quarter inch (3/4") high nameplates when located on starter and panels.

2.2 MISCELLANEOUS SIGNS AND LABELS

A. Metal labels:

1. Material and Thickness: Aluminum, 0.020" minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum label size: Length and width vary for required label content, but not less than 2-½ x ¾ inch.
3. Minimum letter size: ½ inch.
4. Fasteners: Stainless steel rivets or self-tapping screws.
5. Chain: #16 single jack chain length as required.

B. Label content: As required.

C. Signage for miscellaneous valves, hydraulic placards, inspector's test connection, etc. Refer to NFPA 13 for identification requirements for valves.

2.3 STOCK OF SPARE SPRINKLERS SIGN

A. Material: 8½ x 11-inch bond paper laminated and framed, mounted on the wall, or attached to the inside face of the spare sprinkler cabinet.

B. Information required:

1. Sprinkler Identification Number (SIN) if equipped, or the manufacturer, model, K-factor, deflector type, thermal sensitivity, and pressure rating.
2. General description.
3. Quantity of each type to be contained in the cabinet.
4. Issue or revision date of the list.

C. Sample sign:

Sprinklers Contained in this Cabinet			
Sprinkler Identification, SIN	General Description	Temperature Rating, ºF	Sprinkler Quantity Maintained
TY9128	Extended Coverage, K=25, upright	155	6
VK425	Concealed pendent residential	145	6
Issued: 10/3/21	Revised:		

2.4 SPRINKLER SYSTEM GENERAL INFORMATION SIGN

A. Metal Sign:

1. Material and Thickness: Anodized aluminum, 0.20" minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Lettering: Permanent lettering, size as required.

B. Information Required:

1. Name and location of the facility protected
2. Occupancy classification
3. Commodity classification
4. Presence of high-piled and/or rack storage
5. Maximum height of storage planned
6. Aisle width planned
7. Commodity classification
8. Encapsulation of pallet loads
9. Presence of solid shelving
10. Flow test data
11. Presence of flammable/combustible liquids
12. Presence of hazardous materials
13. Presence of other special storage
14. Location of venting valve
15. Location of auxiliary drains and low point drains on dry pipe and preaction systems
16. Original results of main drain flow test
17. Name of installing contractor or designer
18. Indication of presence and location of antifreeze or other auxiliary systems
19. Where injection systems are installed to treat MIC or corrosion, the type of chemical, concentration of the chemical, and where information can be found as to the proper disposal of the chemical

Sample sign:

SPRINKLER SYSTEM – GENERAL INFORMATION
for

_____
_____
_____

High-piled storage □ Yes □ No
Rack storage: □ Yes □ No
Commodity class: _____
Max. storage height _____ ft.
Aisle width (min.) _____ ft.
Encapsulation □ Yes □ No
Solid Shelving: □ Yes □ No
Flammable/
combustible liquids: □ Yes □ No
Other storage: □ Yes □ No
_____
Hazardous materials: □ Yes □ No
Idle pallets: □ Yes □ No
Antifreeze systems □ Yes □ No
Location: _____
Dry or aux systems □ Yes □ No
Location: _____

Date: _____
Flow test data:
Static: _____ psi
Resid: _____ psi
Flow: _____ gpm
Pitot: _____ psi
Date: _____
Location: _____
_____

Location of aux/low point drains:
_____
_____

Dry pipe/double interlock preaction test results
Original main drain test results:
Original main drain test results:
Static: _____ psi
Residual: _____ psi
Venting valve location:_____

Where injection systems are used to treat MIC or corrosion:
Type of chemical: _____Concentration: _____For proper disposal, see:
_____
Name of contractor or designer:_____
Address: _____
Phone: _____

2.5 FLEXIBLE SPRINKLER HOSE FITTINGS

A. Where flexible sprinkler hose fittings are used to connect sprinklers to branch lines in suspended ceilings, a label limiting relocation of the sprinkler shall be provided on the anchoring component.

1. An example of language for the label is as follows:

CAUTION: DO NOT REMOVE THIS LABEL.

Relocation of this device should only be performed by qualified and/or licensed individuals that are aware of the original system design criteria, hydraulic criteria, sprinkler listing parameters, and knowledge of the state and local codes including NFPA 13 installation standards. Relocation of the device without this knowledge could adversely affect the performance of this fire protection and life safety system.

2.6 CEILING LOCATION MARKERS

A. Provide nameplates to indicate the location of equipment and devices located above the ceiling.

B. Equipment shall include:

1. Floor control valves assemblies
2. Control valves
3. Drain valves, plugs, etc.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair the bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of fire suppression equipment.

B. Locate equipment labels where accessible and visible.

3.3 STOCK OF SPARE SPRINKLERS SIGN

A. Mount on the wall adjacent to the sprinkler cabinet or the inside face of the spare sprinkler cabinet.

3.4 SPRINKLER SYSTEM GENERAL INFORMATION SIGN

A. The sign shall be installed at each system control riser, antifreeze loop, and auxiliary system control valve.

3.5 CEILING LOCATION MARKERS

A. After A/E approval, attach the nameplate to the ceiling grid as close to the device as practical.

3.6 NAMEPLATES

A. Submit a listing of all nameplates with associated information to A/E for approval before fabrication.

B. Coordinate the method of attachment and location of the nameplate with the contractor who is responsible for the installation of the device (i.e., control panel, air handler, etc.).

END OF SECTION

SECTION 21 13 00 – FIRE SUPPRESSION SPRINKLER SYSTEMS

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. Pipes, fittings, and specialties
2. Fire-protection valves
3. Sprinklers
4. Sprinkler specialty pipe fittings
5. Alarm devices
6. Pressure gages

B. Related Sections:

1. Division 21 Section "Seismic Controls for Fire Suppression Piping and Equipment" for vibration and seismic-related items.
2. Division 21 Section "Identification for Fire Suppression Piping and Equipment" for signs, labels, and identification requirements.
3. Division 28 Section "Fire Alarm System" for alarm devices not specified in this Section.

1.3 DEFINITIONS

A. High-Pressure Piping: System piping designed to operate at working pressure higher than standard 175 psi but not higher than 250 psig.

B. Standard-Pressure Piping: System piping is designed to operate at a working pressure of 175 psig maximum.

1.4 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for a 175-psig minimum working pressure.

B. Fire Suppression system design shall be approved by the State Fire Marshal. Approval by the State Fire Marshal shall be received before any installation work commences.

1. Fire Suppression systems shall be hydraulically calculated.
2. The margin of Safety for Available Water Flow and Pressure: 20 percent or 10 psi, whichever is greater, including losses through water-service piping, valves, and backflow preventers. If submittals for review by the State Fire Marshal are submitted one year or more after the date of the water flow test date noted on the "FIRE SPRINKLER

SPECIFICATION SHEET" in Part 3 of this Section, the Contractor shall provide a new water flow test at no additional cost to the Owner. Any additional hydraulic calculations required due to the requirement of a new water flow test will be conducted by the Contractor at no additional cost to the Owner.

3. Refer to Part 3 of this Section for a completed "FIRE SPRINKLER SYSTEM SPECIFICATION SHEET" for bidding and design purposes.

C. Sprinkler design shall be hydraulically calculated based on the following:

1. Wet sprinkler systems are as follows:
   a. Light Hazard Areas: Minimum 0.10 GPM per square foot over the most remote 1,500 square feet with a maximum sprinkler spacing of 225 square feet per sprinkler or UL listing. Reduction in remote area size is allowed when using quick response sprinklers per paragraph 19.3.3.2.3 of NFPA 13/2019. Calculations shall include a 100 GPM hose stream allowance.
      1) Classrooms
      2) Where noted on plans
   b. Ordinary Hazard (Group 1) Areas: Minimum 0.15 GPM per square foot over the most remote 1,500 square feet with a maximum sprinkler spacing of 130 square feet per sprinkler or per UL listing. Reduction in remote area size is allowed when using quick response sprinklers per paragraph 19.3.3.2.3 of NFPA 13/2019. Calculations shall include a 250 GPM hose stream allowance.
      1) Assembly rooms
      2) Where noted on plans

2. Dry sprinkler systems are as follows:
   a. Ordinary Hazard (Group 2) Areas: Minimum 0.20 GPM per square foot over the most remote 1,950 square feet with a maximum sprinkler spacing of 130 square feet per sprinkler. Calculations shall include a 250 GPM hose stream allowance.
      1) Canopy areas
      2) Where noted on plans

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For fire suppression systems. Include plans, elevations, sections, details, and attachments to other work.

C. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. HVAC ductwork and equipment
3. Items penetrating the finished ceiling include the following:
   a. Lighting fixtures
   b. Air outlets and inlets
   c. Speakers
   d. Projectors

4. Drawings shall include sections and elevations as required to indicate pipe routing and coordination with other utilities.

D. Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, shall be submitted to the Architect/Engineer, including hydraulic calculations. Once the Architect/Engineer's approval has been received, the Contractor shall submit plans and calculations to State Fire Marshall for final approval.

E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping" as applicable.

F. Field quality-control reports.

G. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. The systems shall be designed, fabricated, and installed by a licensed fire protection contractor or contracting firm regularly engaged in the installation of fire protection systems. The Architect may require evidence to support the above requirements and may reject any proposed contractor who cannot show suitable experience.
2. The Contractor must be certified as a NICET Level III, minimum, for fire sprinkler systems and shall submit data showing the same.
3. The Contractor shall furnish evidence that there is an experienced and effective service organization that carries a stock of repair parts for the system to be furnished. Should the Contractor fail to comply with the service requirements of this Section, the Owner or his Representative will then have the option to make the necessary repairs and back-charge the Contractor without any loss of warranty or guarantee as provided by the Contract Documents.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 (2020 Edition), by a qualified testing agency, and marked for intended location and application.

C. NFPA Standards: Fire Suppression system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13 (2019 Edition), "Installation of Sprinkler Systems."
2. NFPA 25 (2020 Edition), "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems."

D. Piping: The Owner and Architect/Engineer reserve the right to inspect, sample, and test any pipe after delivery and to reject all pipes represented by any sample which fails to comply with the specified requirements. Inspection of the 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.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Fire Suppression Service: Do not interrupt fire suppression service to facilities occupied by the Owner or others unless permitted under the following conditions and then only after arranging to provide temporary fire suppression service according to the requirements indicated:

1. Notify Architect and Owner no fewer than two days in advance of the proposed interruption of sprinkler service.
2. Do not proceed with the interruption of sprinkler service without Architect's and Owner's written permission.

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match the products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for a minimum of six spare sprinklers plus sprinkler wrench. Provide a minimum of two sprinklers of each type and temperature rating. Include a separate cabinet with sprinklers and a wrench for each type of sprinkler used on the Project. Provide “Stock of Spare Sprinkler Sign” as required by NFPA 13 and section 21 0553 of these specifications.

PART 2 - PRODUCTS

2.1 STEEL PIPE AND FITTINGS

A. Piping shall meet the requirements of NFPA 13. Material shall be new domestic materials of standard manufacture suitable for specified use. The contractor shall base his bid on the use of one or a combination of the following:

1. Above Grade Piping:
   a. Piping 1-1/4" and larger shall be Schedule 10 (meeting ASTM A-135 or A-795 requirements) or Schedule 40 (meeting ASTM A-53 requirements) steel piping with welded outlets and mechanical grooved ends.
   b. Piping 1 through 2" shall be Schedule 40 with threaded fittings.
   c. Instead of threaded steel piping systems, Victaulic Installation-Ready™ Fittings for sizes 1-1/4” thru 2-1/2” and FireLock IGS System with “Installation-Ready™ fittings and couplings may be used for 1” diameter Schedule 10 and 40 steel pipe. The system shall be rated for a working pressure of 365 psi.
      1) Installation-Ready™ fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, pre-lubricated Grade “E” EPDM Type ‘A’ gasket, and ASTM A449

electroplated steel bolts and nuts. UL listed for a working pressure of 300 psi and FM approved for a working pressure of 365 psi.

2) Groove: IGS “Innovative Groove System” groove with shortened “A” dimension and tapered groove backside for ease of installation.
   a) Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.

3) IGS Fittings:
   a) Ductile iron housing conforming to ASTM A-536, Grade 65-45-12. Orange enamel-coated or galvanized.
      i. Victaulic Style 101 (90-degree elbow), Style 102 (tee), and Style 108 (coupling) with Installation-Ready™ ends.
      ii. Style 108 single-bolt coupling provided with EPDM Type A pressure-responsive gasket with Vic-Plus lubricant, and ASTM A449 compliant electroplated steel bolt and nut. CrMo alloy steel coupling linkage.
   b) Thread x Groove adapter fittings and welded outlets with IGS grooved end, ASTM A53, grade A.

d. Pipe and fittings used in dry pipe systems shall be Schedule 40 (meeting ASTM A-53 requirements) steel piping with mechanical cut grooved pipe couplings and fittings for piping 1-1/2” and larger; threaded fittings for piping 1-1/4” and smaller. Dry pipe system piping exposed to the weather shall be hot-dipped zinc-coated (galvanized).
e. Piping and fittings exposed to ambient conditions or installed on the exterior shall be hot-dipped zinc-coated (galvanized).
f. Pipe and fittings exposed to the weather shall be hot-dipped zinc-coated (galvanized) including drain piping (main and auxiliary) downstream of the drain valve.

B. Malleable- or Ductile-Iron Unions: UL 860, 2" and smaller.

C. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Material shall be new domestic materials of standard manufacture suitable for specified use. The installing contractor shall select one manufacturer to be used throughout the project. The use of multiple manufacturers is not acceptable. Subject to compliance with requirements, provide products by one of the following:
   a. Victaulic Company
   b. Anvil International, Inc./ASC Engineered Solutions
   c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Pressure Rating: 175 psig minimum.
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A536, ductile-iron casting; with dimensions matching steel pipe. In applicable sizes, fittings shall be short pattern, with flow equal to standard pattern fittings. Basis of Design: Victaulic Fire-Lock.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, Grade "A" EPDMA-rubber gasket, and bolts and nuts.
   a. Provide Installation-Ready center-leg gaskets with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth where applicable.

b. Provide Tri-Seal or Flush Seal® Grade "E" EPDM-rubber flush seal gaskets for dry pipe service.
c. Rigid Type: Housings cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging per NFPA 13, fully installed at visual pad-to-pad offset contact. Couplings that require exact gapping at specific torque ratings are not permitted.
   1) Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 009N and 107N.

d. Flexible Type: For use in locations where vibration attenuation, and stress relief or seismic areas as required by NFPA 13.
   1) Basis of Design: Victaulic Installation-Ready Style 177.

2.2 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8-inch-thick or ASME B16.21, nonmetallic, and asbestos-free.

1. Class 125, Cast-Iron Flanges, and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges, and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts, and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Grooved Joint Lubricants: Lubricate the gasket per the manufacturer’s published instructions with lubricant approved for the gasket elastomer and fluid media.

2.3 HANGERS AND SUPPORTS

A. General: The Contractor shall provide all necessary hangers, supports, bracing, accessories, etc., as required for proper installation of the work, and only approved type hangers shall be used. All piping must be substantially supported by the building structure.

B. Structural steel, other than the building structure or special supports provided under another section of the specifications, required for proper supporting of piping and equipment shall be furnished and installed under this section of the specifications.

C. Piping supported from floors shall be provided with steel support bases.

D. All hangers on piping including clevis hangers, inserts, clamps, stanchions, and brackets, shall be dipped in zinc chromate primer before installation. Rods shall be galvanized.

E. All threaded rods, bolts, clamps, fasteners, concrete inserts, saddles, and accessories installed on the roof, in the crawl space, or exposed to ambient shall be 304L stainless steel.

F. All auxiliary support steel installed on the roof, in the crawl space, or exposed to ambient may be hot-dipped galvanized if not welded or field cut or drilled, and 304L stainless steel if welded or field cut or drilled.

G. Piping shall be seismically restrained as required in Section 210548.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
3. Minimum Pressure Rating for High-Pressure Piping: 250 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Victaulic Company
   b. Anvil International, Inc./ASC Engineered Solutions

2. Standard: UL 1091 except with a ball instead of a disc.
3. Valves NPS 1-1/2 and Smaller: Bronze or brass body with threaded or grooved ends.
4. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
5. Valves NPS 3: Ductile-iron body with grooved ends.

C. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Victaulic Company
   b. Anvil International, Inc./ASC Engineered Solutions
   c. Kennedy Valve; a division of McWane, Inc.
   d. Milwaukee Valve Company
   e. NIBCO INC.
   f. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Standard: UL 1091.
3. Pressure Rating: 300 psig
4. Body Material: Cast or ductile iron
5. Seat: Pressure responsive elastomer
6. Stem: Stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating.
7. End Connections: Grooved

D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Victaulic Company
   b. Anvil International, Inc./ASC Engineered Solutions
   c. Fire-End & Croker Corporation
   d. Globe Fire Sprinkler Corporation
   e. Kennedy Valve; a division of McWane, Inc.
   f. Mueller Co.; Water Products Division
   g. NIBCO INC.
   h. Reliable Automatic Sprinkler Co., Inc.
   i. Tyco Fire & Building Products LP
   j. Viking Corporation

2. Standard: UL 312
3. Pressure Rating: 250 psig minimum
4. Type: Spring-assisted swing check
5. Body Material: Cast ductile iron
6. Spring: Stainless steel
7. End Connections: Flanged or grooved

E. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Victaulic Company
   b. Anvil International, Inc./ASC Engineered Solutions
   c. Kennedy Valve; a division of McWane, Inc.
   d. Milwaukee Valve Company
   e. NIBCO INC.
   f. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP

2. Standard: UL 1091
3. Pressure Rating: 175 psig minimum
4. Valves NPS 2 and Smaller:
   a. Valve Type: Ball or butterfly
   b. Body Material: Bronze or brass
   c. End Connections: Threaded or grooved

5. Valves NPS 2-1/2 and Larger:
   a. Valve Type: Butterfly
   b. Body Material: Cast or ductile iron
   c. Seat: Pressure responsive elastomer
   d. Stem: Stainless steel, offset from the disc centerline to provide complete 360-degree circumferential seating
   e. End Connections: Flanged, grooved, or wafer

6. Valve Operation: Weatherproof actuator housing with integral electrical, 125-V ac, prewired, two-circuit, supervisory switch visual indicating device.
7. Valves installed on the backflow preventer test connection line, fire pump test header line, flow meter line, and elsewhere, as noted on plans, shall be designed for normally closed position monitoring.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing
2. Pressure Rating: 175 psig minimum

B. Universal Test & Drain Assembly:

1. A single-body universal test and drain valve with a 3-way body shall be of bronze body construction, incorporating stainless steel components, and shall be rated for a working pressure of 300 psi., and a universal test orifice of K2.8 (1-1/2” pipe and smaller), K4.2 (2”-3” piping), and K5.6 (4” and larger piping); to provide testing capabilities of systems with k-factors ranging from K5.6 and larger.
2. UL listed and FM approved.
3. Basis of Design: Victaulic Series UTD; Universal Test & Drain Valve with Victaulic Series ARV; Adjustable Relief Valve.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum
   b. High-Pressure Piping Specialty Valves: 250 psig minimum
3. Body Material: Cast or ductile iron
4. Size: Same as connected piping
5. End Connections: Flanged or grooved

B. Vapor Phase Corrosion Inhibitor System:

1. Basis-of-Design Product: Subject to compliance with requirements, provide General Air Products, Inc.; Vapor Pipe Shield.
2. Description: Vapor phase Corrosion Inhibitor (VpCI®) delivery system for dry fire sprinkler systems providing corrosion protection within the sprinkler system piping network. A pneumatic and mechanical device that requires no electricity.
3. Standard: UL 2901B
4. Capacities and Characteristics:
   a. The system shall be based on the total sprinkler system capacity and the largest single system capacity of the dry pipe system as calculated by the Division 21 Contractor.
   b. The system shall include a shutoff valve to permit servicing without shutting down the sprinkler system.
   c. Maximum Operating Pressure: 150-psig
   d. Operating Temperature Range: 40°F - 150°F
5. Included Components:
   a. Stainless Steel Media Enclosure
   b. Water Removal Pre-filter and After-filter
   c. (2) Coalescing Pre-filters
   d. Air Inlet and Outlet ½” FNPT Connections
   e. Shutoff / Isolation Valve
   f. Automatic Drain Ports 3/8” push to connect tubing
   g. ½” Union and 30” Stainless Steel Flex Hose with ½” MNPT Connections
   h. Vapor Indicator Test Port
   i. Wall Mounting Kit

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Reliable Automatic Sprinkler Co., Inc.
   b. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum
4. Type: Automatic draining, ball check
5. Size: NPS 3/4
6. End Connections: Threaded

2.7 SPRINKLER SPECIALTY PIPE FITTINGS

A. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AGF Manufacturing Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
   d. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with an orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

B. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AGF Manufacturing Inc.
   b. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.
7. Accessories: Pressure relief valve.

C. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Victaulic, VicFlex AH2
   b. FlexHead Industries, Inc. Superflex

2. Standard: UL 2443 and FM 1637.
3. Type: Braided flexible hose for connection to a sprinkler, and with a bracket for connection to the ceiling grid. Coordinate with ceiling grid requirements for bracket length.
4. Pressure Rating: 175 psig minimum.
5. Bend radius to 2 inches (UL Listed) for proper installation in confined spaces.
6. The hose shall be listed for (4) bends at 31” length, (5) bends at 36” length, (8) bends at 48” length, (10) bends at 60” length, and (12) bends at 72” length. Union joints shall be provided for ease of installation.
7. Size: Same as connected piping, for a sprinkler.

D. In-Line Corrosion Monitor for Wet and Dry Pipe Fire Sprinkler Systems:

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. AGF Manufacturing Inc.; CORRinSITE™ Model 7700.

2. Standards:
   a. NFPA 13 and NFPA 25.

3. Specifications:
   a. Service Pressure: 300 PSI.
   b. Operating Temp.: -40°F to 200°F.
   c. Material: Mild Carbon Steel.
   d. Wear Dimension: 0.040 inches.
   e. Sizes: As required for piping; 2” through 8” diameter.
   f. Pipe Schedule 10.
   g. Pipe System Application For Black and Galvanized Pipe to match the piping material used for the fire sprinkler system.

4. Model 7700 is an In-Line Spool version.

   Model 7800 is a Mechanical Tee version.

5. Finishes:
   a. Powder-coat.
      1) Color: Red.

E. Automatic Air Vent Assembly:

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. AGF Manufacturing Inc. PURGE$_N$VENT model

2. Automatic Air Vent:
   a. Pressure Rating: 300 psig and, 175 psi for air vent.
   b. Body Material: Forged brass body.
   c. Components: Integrated ball valve, stainless steel strainer, purge valve with hose connection (field adjustable), thread cap with lanyard, automatic air vent.
   d. Size: NPS 1 NPT inlet by NPS 3/4 NPT outlet.
   e. Drainage Piping: NPS 1/2.

3. Pressure Rating: 175 psi

2.8 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Reliable Automatic Sprinkler Co., Inc.
2. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
3. Victaulic Company.
4. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
3. Sprinklers installed in light hazard occupancies shall be quick response.

C. Sprinkler Types:

1. Refer to plans for sprinkler types and locations.

D. The actual sprinkler count, by sprinkler type, shall be provided by the Contractor.

E. Install sprinklers of proper temperature rating, as required by NFPA 13, and as follows:

1. Ordinary temperature-rated sprinklers shall be installed in all areas unless there are other areas requiring higher temperature rating sprinklers as required by NFPA 13.

2.9 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Pressure Switches:

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. Potter Electric Signal Company.
   b. System Sensor; a Honeywell company.
   c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP.
   d. Viking Corporation.

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

C. High-Low Air Pressure Switch:

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. Potter Electric Signal Company
   b. System Sensor; a Honeywell company
   c. Tyco-Fire, a division of Johnson Controls Fire & Building Products LP
   d. Viking Corporation

2. Type: Electrically supervised pressure type supervisory switch.
3. Components: Two single-pole, double-throw switches
4. Design Operation: Indicate a pressure decrease of 10 psi from normal and a pressure increase of 120 psi from normal.

D. Valve Supervisory Switches:

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. Kennedy Valve; a division of McWane, Inc.
   b. Potter Electric Signal Company.
   c. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that the controlled valve is in other than a fully open position.

2.10 PRESSURE GAUGES

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. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Accuracy: Plus or minus 3-2-3 percent minimum.

F. Pressure gauges installed on Fire Pump lines shall be liquid-filled.

G. Water System Piping Gage: Include a "WATER" or "AIR/WATER" label on the dial face.

H. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on the dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to existing dry and wet sprinkler system.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate the general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File the written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with a shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. All drain lines, relief lines, etc. shall extend to the exterior unless noted otherwise. Piping shall discharge to a 24" square x 4" thick concrete pad.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13 unless noted otherwise in this section.

M. Pressurize and check dry sprinkler system piping and air-pressure maintenance devices.

N. Fill sprinkler system piping with water.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings the same as or higher than the system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and removes any burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove at the end of the pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

I. Dissimilar-Material Piping Joints: Make joints using adapters compatible with the materials of both piping systems.

3.4 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open (unless noted otherwise), located to control sources of water supply except fire-department connections. Install permanent identification signs indicating the portion of the system controlled by each valve.

C. Specialty Valves:

1. General Requirements: Install in a vertical position for proper direction of flow, in the main supply to the system.

D. Vapor Phase Corrosion Inhibitor System: Install at fire riser assembly and per manufactrer’s requirements.

E. In-Line Corrosion Monitor for Wet and Dry Pipe Fire Sprinkler Systems: Install at each fire riser assembly and per manufacturer’s requirements.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in the center of the narrow dimension of and at quarter points (for 2' x 4' acoustical panels) acoustical ceiling panels.

B. Install dry-type sprinklers with a water supply from a heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Sprinklers installed in lay-in suspended ceilings shall be installed into flexible, sprinkler hose fittings and install hose into the bracket on ceiling grid.

3.6 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Refer to Division 21 "Identification for Fire Suppression Piping and Equipment" for additional information.

C. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Flushing and pressure testing of piping shall be witnessed by a third-party inspection service, engineer of record, or local fire official. Invitations to witness flushing and/or testing shall be provided to all parties noted above. Provide a minimum of forty-eight (48) hours of notification before flushing and/or testing the system.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Leak Test: After installation, charge systems, and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are the same as local fire department equipment.

D. The sprinkler piping system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than the factory finish.

3.9 FIRE SPRINKLER SYSTEM SPECIFICATION SHEET

A. Attached is a completed fire sprinkler system specification sheet for bidding and design purposes.

Fire Sprinkler System Specification Sheet

(Per §40-10-250)

Project Data

Project	State Project Number: H59-N301-SB | GMC Project Number: ACOL240010 | Date: 12/15/2025		
Location in South Carolina:	Address (street # & name): 1260 Lexington Drive		State Project: ☑ Yes ☐ No
	City: West Columbia	County: Lexington	State Project #: T07-N301-PG

Water Supply Information

(Flow test data must be less than 1 year old per §40-10-250(A)(1))

Date test conducted: 03/03/2025	Static pressure (psi): 48	Residual pressure (psi): 36	Flow (gpm): 1,425
Distances of test gauges relative to the base of the riser:	Horizontal (ft):	Vertical (elevation difference in ft):	
Source of water supply:	☐ Municipal dead-end ☑ Municipal circulation ☐ existing fire pump ☐ Other:		Pipe Size (in.): 10
Test data by/from:	Name: Ricardo Haigler/Wesley Oseman	Title:	
	Organization: City of Cayce		Phone: 803-796-9020
Fire pump: ☐ New ☑ Existing ☐ No Pump	Rated Pressure (psi): 80	Churn Pressure (psi): 96	
	Rated Capacity (gpm): 750	Pressure @ 150% flow (psi): 57	
On-site water storage:	☐ Yes ☑ No ☐ New ☐ Existing	☐ Tank ☐ Other:	Capacity (gal):

NFPA Hazard Classification

(Attach continuation page when necessary)

Area #	Hazard Class or Code Reference	Description of Hazard Protected (including occupancy use group, and details of storage arrangement as applicable (including commodity class, rack arrangement/type, ceiling and storage height.))
1	Light Hazard Occupancy	Classrooms; Where noted on plans
2	Ord. Hazard Group II	Assembly Rooms; Where noted on plans
3	Ord. Hazard Group I	Exterior Canopy Area; Where noted on plans

Design Parameters

(Attach continuation page when necessary)

Area #	System Type	Density(gpm/ft^2)/Area(ft^2), or Other (Reference code sections)	Inside Hose (gpm)	Outside Hose (gpm)
1	Wet Sprinkler	0.10 gpm/ft^2 / 1,500 ft^2 *	0	100
2	Wet Sprinkler	0.20 gpm/ft^2 / 1,500 ft^2 *	0	250
3	Dry Sprinkler	0.15 gpm/ft2 / 1,950 ft2	0	250

Seismic Design Data:	SS= 0.346	Site Classification= D	Seismic Design Category= C

Codes and Standards

(Attach continuation page when necessary)

Applicable Codes, Standards, & Editions (i.e., 2018 IBC, 2016 NFPA 13, etc.) for the Scope of Work on the Fire Sprinkler System

IBC/2021; IFC/2021; NFPA 13/2019

* - Reduction in the hydraulically remote area when using quick response sprinklers per paragraph 19.3.3.2.3 of NFPA 13/2019.

Scope of work (i.e., sprinkler system A.G. from 1'-0" A.F.F., U.G. from tap to 5'-0" outside, etc.) and notes (attach continuation page when necessary):
Scope of work begins to connection to existing aboveground system.

Specifier's Information

Name: Mark L. Watts

Engineering services provided through a firm: ☒ Yes ☐ No

Firm name: Buford Goff & Associates, Inc.

Address: 1331 Elmwood Avenue, Suite 200

City: Columbia

State: South Carolina Zip: 29201

Phone #: 803-254-6302 Fax #: 803-771-6142

E-mail: Mark.Watts@BGAinc.com

SOUTH CAROLINA BUFORD GOFF & ASSOCIATES, INC. No. 000022 CERTIFICATE OF AUTHORIZATION

Certificate of Authorization

SOUTH CAROLINA PROFESSIONAL ENGINEER Mark L. Watts No. 12614 12/15/2025 REGISTERED MARK L. WATTS

Professional Engineer's Seal

Revision No.: _____ Page 1 of 1 Signature: Mark L. Watts

Date: 12/15/2025

END OF SECTION

SECTION 22 05 00 - 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

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 into 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 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. ANSI: American National Standards Institute
2. ASME: American Society of Mechanical Engineers
3. ASTM: American Society of Testing and Materials
4. AWWA: American Water Works Association
5. NEMA: National Electrical Manufacturer's Association
6. OSHA: Occupational Safety & Health Administration
7. 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 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. Nondurable 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

SECTION 22 05 01 - 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 shown on the drawings and specified hereinafter.

B. Description:

1. Rooftop curbs shall include all supports for rooftop pipe and accessories.

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

3. The following acoustical sealant (gypboard) manufacturers are acceptable:
   a. USG or equal

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. Roof curbs and piping support curbs shall be provided for all flues and piping located on a roof.

2.2 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. Devoe Paints Industrial Enamel

2.3 FLASHING

A. General:

1. Provide flashing and counter flashing on all pipes, and other plumbing system components which penetrate exterior walls or roofs.
2. Flashing sizes shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. Plumbing Vents:

1. Rubber flashing caps shall be provided on metal roofing systems in accordance with the metal roofing manufacturer's requirements.

C. Plumbing Pipe:

1. Rubber flashing caps shall be provided.

2.4 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

2.5 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.

PART 3 - EXECUTION

3.1 FLASHING

A. Plumbing Vents:

1. Vent piping shall terminate a minimum of twelve (12) inches above finished roof level unless noted otherwise. Where vent piping is located in a roof “well” area or areas enclosed with high parapet walls, vent piping shall terminate a minimum of twelve (12) inches above highest parapet wall.

2. Metal flashing shall extend at least 12" in all directions from pipe and be turned down a minimum of 3" inside top of pipe.
3. Rubber flashing shall be secured to pipe with stainless steel clamps.

3.2 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.

3.3 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.

3.4 EXTERIOR SEALANT

A. Submit color charts to A/E.

3.5 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

SECTION 22 05 03 - 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. At no time shall require 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

SECTION 22 05 05 - 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.

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 pipelines 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 freshwater 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

SECTION 22 05 10 - 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. Reports, 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 manufacturers' instructions and descriptive literature on all items of equipment furnished under this work. Provide a PDF of this information on a CD.

B. Where laminated documents are required, only one set shall be provided.

C. 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. List of Spare Parts: Recommended for normal service requirements. Each piece of equipment shall have this list clearly marked or attached to this submittal.
6. Parts List: Identifying the various parts of the equipment for repair and replacement purposes.
7. Wiring Diagrams: Generalized diagrams are not acceptable; submittal shall be specifically prepared for this Project.
8. All start-up reports.

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. Instructions 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 filled out by the Contractor prior to acceptance of the project by the A/E.

4.2 PLUMBING CLOSEOUT LIST

PLUMBING CLOSEOUT DOCUMENT PROJECT: MTC AMSC CENTER ADDITION & RENOVATIONS BGA PROJECT NO.: 24094			
DOCUMENT	DATE REVIEWED	DATE RETURNED	COMMENTS
Water Quality Report			
Plumbing marked-up As-Builts (1 set red lined)			
Factory Test Reports			
Equipment Start-Up Reports			
Piping Start-Up Reports			
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: MTC AMSC CENTER ADDITION & RENOVATIONS

BGA PROJECT NO.: 24094

INSTRUCTIONS	DATE/TIME SCHEDULED	MINIMUM SPECIFIED HOURS	ESTIMATED HOURS OF INSTRUCTION	PERSONS ATTENDING	COPY OF SIGN-IN LIST SENT TO BGA
Plumbing General					

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.

4.4 PLUMBING SPARE MATERIALS

PLUMBING SPARE MATERIALS LIST
PROJECT: MTC AMSC CENTER ADDITION & RENOVATIONS
BGA PROJECT NO.: 24094

ITEM	DATE DELIVERED	ACCEPTED BY	COPY OF RECEIPT SENT TO BGA
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: MTC AMSC CENTER ADDITION & RENOVATIONS

BGA PROJECT NO.: 24094

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

SECTION 22 05 11 - 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 is 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 cannot 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.		
	Access Panels									
	Backflow Preventors									
	Balancing Valves									
	Chair Carriers									
	Dielectric Fittings									
	Electric Heat Tape									
	Equipment and Pipe Identification									
	Escutcheons									
	Firestop Material									
	Fittings and Flange Certificates									
	Flexible Pipe Connections									
	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									
	Pipe Hangers and Supports									
	Pipe Shields									
	Pipe Sleeves									
	Plumbing Fixtures									

BGA NO.	PRODUCT	NO.	DATE		STATUS				ITEMS TO RESUBMIT	DATE ITEMS RESUBMITTED
			In	Out	App.	AAN	Resub.	Rej.		
	Seismic Products									
	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: MTC AMSC CENTER ADDITION & RENOVATIONS **BGA File No**. 24094-5-33

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

SECTION 22 05 17 - 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 22 05 03 - Demolition, Patching and Repair
2. Section 22 05 07 - Firestopping and Smokestopping
3. Section 22 11 00 – 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.
2. Provide sleeves where required by UL fire stop assembly selected.
3. Do not provide sleeve when not permitted by UL firestop assembly selected.

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. 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).
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 all pipe exiting basement utility spaces (i.e., mechanical room, etc.).
2. All pipe shall have seals and sleeves including but not limited to:
   a. Domestic water
   b. Sanitary sewer
   c. Acid waste
   d. Conduit

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. Where proper firestopping or insulation cannot be installed, sleeve shall be reset.

3.2 MECHANICAL SEAL

A. Install short section of capped pipe and test integrity of sleeve as recommended by the manufacturer.

END OF SECTION

SECTION 22 05 19 - 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 vertically or at an angle so as to retain oil.

C. Thermometer wells shall be:

1. Trerice
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. Trerice
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

SECTION 22 05 23 - 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. Check valves.
3. Iron, center-guided check valve.
4. Automatic Flow Control valves.
5. Balance valves (Calibrated).
6. Thermostatic Water Mixing valves.

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: Non rising 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 3rd Party Certified.

D. Manufacturers:

1. The following ball valve manufacturers are acceptable:
   a. Apollo
   b. Nibco
   c. Milwaukee

2. The following gate, globe and check valve manufacturers are acceptable:
   a. Apollo
   b. Nibco
   c. Milwaukee

3. The following thermostatic mixing valves are acceptable:
   a. Leonard
   b. Symmons
   c. Rada
   d. Lawler
   e. Apollo

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. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

G. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

H. Valve Sizes: Same as upstream piping unless otherwise indicated.

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 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 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. Manifolded, 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.

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 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.

END OF SECTION

SECTION 22 05 29 - 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-time 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. Pipe 2" and smaller - 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. Pipe 2" and smaller (domestic hot water 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)

A. All pipe sizes - Swivel loop hanger:

1. B-Line B3170 CTC (with PVC coating)

2.10 PIPE HANGERS - NON-INSULATED PIPE (PVC)

A. Pipe 2" and smaller - swivel loop hanger:

1. B-Line Fig. 200C (with PVC coating)

2.11 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

2.12 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. Non-metallic Pipe (PVC):

1. Provide spacing as recommended by the manufacturer but no greater than 4 feet.

C. Copper Pipe and Tubing:

Size	Max. Span Ft.
Smaller than 1-1/2"	5
1½" and larger	8

D. Steel (Std. Weight):

Size	Max. Span Ft.
1½" and smaller	7
2" and larger	10

2.13 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:

Rod Dia.	Max. Load	Max. Load (@ 2 x SF)
3/8	610	305
1/2	1130	565
5/8	1810	905
3/4	2710	1355
7/8	3770	1885
1	4960	2480

2.14 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.

2.15 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.).

2.16 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

2.17 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

SECTION 22 05 53 - 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, 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 PIPING PAINTING

A. The following exposed piping systems, bare and insulated, in mechanical rooms, corridors, and all other spaces where visible without removing ceiling, shall be given two coats of finish paint over the prime coat:

Cold Water – Light Blue
Hot Water – Dark Orange
Hot Water Return – Light Orange
Sewer Piping – Dark Green
Vent Piping – Light Green

2.4 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.

2.5 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

2.6 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.

END OF SECTION

SECTION 22 05 92 - 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, storm drainage, 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.

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 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 pipelines 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, 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 hammering and thumping.

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

SECTION 22 06 01 - 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 dielectric fitting manufacturers are acceptable:
   a. Perfection Corporation
   b. Victaulic

PART 2 - PRODUCTS

2.1 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.

2.2 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

C. Dielectric fitting shall be:

1. Hydronic systems - 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.

END OF SECTION

SECTION 22 07 00 - 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 22 07 16 – Plumbing Equipment Insulation
2. Section 22 07 19 – 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 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

SECTION 22 07 19 - 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 220700 – 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

3. The following aluminum jacket manufacturers are acceptable:
   a. Childers
   b. RPR Products

4. The following stainless steel jacket manufacturers are acceptable:
   a. Childers
   b. RPR Products

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 and Polyolefin Pipe 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 and Polyolefin Pipe 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 JACKETING

A. Aluminum Jacketing:

1. General:
   a. Jacketing shall be manufactured from Type 1100, 3003, 3105 and 5005 alloys.
   b. Jacketing on piping shall be corrugated. Corrugation shall be 3/16 inches.
   c. Jacketing on equipment shall be smooth.

2. Thickness:
   a. Pipe jacket shall be .016 inches.
   b. Equipment jacket shall be .024 inches.

3. Vapor Barrier:
   a. Continuous lamination to jacket.
   b. One mil polyethylene film with 40 lb. virgin kraft paper.

B. Stainless Steel Jacketing:

1. General:
   a. Provide a complete system of manufactured jacketing for valves, piping, fittings, and equipment.

b. Jacketing shall be Type 304L stainless steel with a standard 2B mill finish.

2. Pipe:
   a. Jacket shall be factory fabricated for each pipe size. The jacketing shall have a continuous modified Pittsburg Z-lock.
   b. Jacket shall be smooth and shall be .016" thick.
   c. Jacket shall be:
      1) Childers Strap-On Fabricated Jacketing System

3. Fittings and Valves:
   a. Jackets for filling, valves, and accessories shall be factory fabricated for each fitting, valve, and accessories including, but not limited to, elbows, tees, valves, and flanges.
   b. Jackets larger than available from manufacturers in standard sizes shall be custom fabricated by the manufacturer.
   c. Jacket shall be smooth and shall be .024" thick.

4. Equipment:
   a. Jacketing shall be smooth and .016" thick.

5. Vapor Barrier:
   a. Continuous lamination to jacket.
   b. One mil polyethylene film with 40 lb. virgin kraft paper.

2.6 FINISH

A. Exposed Piping (in equipment rooms and elsewhere throughout the facility) shall be one of the finishes listed below as selected by the contractor unless a type of finish is specifically indicated:

1. Glass fabric and two coats mastic, one coat vapor barrier sealant.

B. Fittings:

1. Fittings adjacent to ASJ jacket shall be finished with PVC jacket.
2. Fittings adjacent to jacketing other than ASJ shall be finished similar to piping.

2.7 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).

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 - ½" thk.
2. 1½" 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 SCHEDULE

A. Domestic Cold-Water Piping located in chase/wall:

1. All pipe - ½" thk.

B. Domestic Hot Water Piping located in chase/wall:

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 using 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 FIRERATED ASSEMBLIES

A. Insulation shall run through firerated assemblies. Where insulation is not approved for routing through fire rated assemblies, transition to an approved fire rated insulation of the same thickness where the insulation is routed through the fire rated assembly. The transition shall occur between a minimum of six (6) inches and a maximum of twelve (12) inches from assembly on both sides of assembly.

4.6 MULTI-LAYER INSTALLATION

A. Joints shall be staggered.

END OF SECTION

SECTION 22 11 00 - 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) Copper Tube, Water, (Fuel Oil) 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 (natural gas, LP), ACR. ASTM B280
      7) Copper tube (medical gas), oxygen, med. ASTM B819

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 Heavy Duty
   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 pipe Manufacturers are acceptable:
   a. Charlotte

b. NIBCO
c. Approved equal

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 Drainpipes, 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 may 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 up to 4 inches, above grade shall be seamless hard drawn, Type L, copper pipe, with wrought copper fittings.
4. All exposed water piping to plumbing fixtures and to kitchen equipment shall be IPS chrome-plated yellow brass pipe with polish chrome-plated 125 pound screwed brass fittings. Pipe shall be seamless drawn semi-annealed containing not less than 85% copper and conforming to ANSI H27-1.

D. Relief Valve Discharge and Vent Piping:

1. Piping shall be seamless hard drawn, Type L, copper pipe.

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. Bullhead 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.

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 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.

3.4 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.

3.5 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.

3.6 BELOW GRADE PIPE

A. All pipes shall be inspected before backfilling.

3.7 CONCEALED PIPE

A. Test all pipe prior to concealing or insulating.

3.8 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

SECTION 22 40 11 - 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 roof drain manufacturers are acceptable:
   a. Mifab
   b. J. R. Smith
   c. Wade
   d. Josam
   e. Zurn
   f. Watts

2. The following floor drain manufacturers are acceptable:
   a. Mifab

b. J. R. Smith
c. Wade
d. Josam
e. Zurn
f. Watts

3. The following floor cleanout manufacturers are acceptable:
   a. Mifab
   b. J. R. Smith
   c. Wade
   d. Josam
   e. Zurn
   f. Watts

4. The following backflow preventer manufacturers are acceptable:
   a. Conbraco
   b. Watts
   c. Apollo

5. The following water hammer arrester manufacturers are acceptable:
   a. Mifab
   b. J. R. Smith
   c. Sioux Chief
   d. Watts
   e. Zurn

6. The following trap seal primer device manufacturers are acceptable:
   a. Mifab
   b. Precision Plumbing Products
   c. Josam

7. The following trap seal protection device manufacturers are acceptable:
   a. SureSeal Manufacturing; Inline Floor Drain Trap Sealer

PART 2 - PRODUCTS

2.1 ROOF DRAINS

A. Provide roof drains at locations shown on plans. Where no size is shown, provide drain same size as connecting piping.

B. Drains shall be cast iron body with combined flashing collar and gravel stop with non-ferrous dome.

C. Expansion joints shall be provided as required. Provide Mifab Model R1900 vertical expansion joint.

D. Roof drains shall be:

1. Poured concrete decks: Provide Mifab Series R1200-M-80 set in poured roof deck slab with an aluminum dome. Flashing is secured by a non-puncturing type of flashing device.

2. Pre-cast deck: Provide Mifab Series R1200-U-M-80 drain body with underdeck clamp. Use where roof drain openings are pre-sleeved in the slab. The Underdeck clamp shall provide positive anchoring of the drain body.
3. Insulated deck: Provide Mifab Series R1200-B-E-U-M-80 drain body with sump receiver, adjustable extension, underdeck clamp, and aluminum dome. Adjust extension for insulation thickness.
4. Promenade deck drain: Provide Mifab R1100-P-3 drain with 1” thick, 8” square adjustable ductile iron tractor grate with stainless steel veneer.

E. Roof Drain Flashing:

1. Flashing sizes where shown are minimum sizes but in no case shall they be less than the size required by the roofing manufacturer.
2. Drains shall be flashed and made watertight using a 4-pound sheet lead. Flashing shall extend 18 inches from the drain body in all directions.

2.2 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 the 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 a waterproofing membrane.

F. All strainer tops to be reinforced to prevent cupping.

G. Outlet connection for floor drains installed at grade level shall be push-on. The 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 F1000-3-7 cast iron drain with 6" round adjustable reinforced stainless-steel top with trap seal primer tapping.
FD-2:	Mechanical Equipment Room Floor Drains: Mifab Series F1340-4-5-7-13-14 cast iron galvanized drain and sediment bucket with 12” round adjustable non-tilt ductile iron tractor grate with trap seal primer tapping.

2.3 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 secondary threaded plastic/ABS plug 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 C1220-R-3 (round top) cast iron adjustable floor level cleanout assembly with a stainless steel top.
2. Finished Room Floors (Square Top): Mifab Series Mifab Series C1220-S-3 (square top) cast iron adjustable floor level cleanout assembly with a stainless steel top.
3. Unfinished Floors: Mifab Series C1220-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.

2.4 VACUUM BREAKERS

A. Vacuum breakers shall be constructed as follows:

1. The body shall be chrome-plated brass.
2. The retainer tube screen, cap, and collar shall be stainless steel.
3. The ball check shall be stainless steel.
4. The seat shall be a resilient "O" ring.
5. Size shall be line size or as indicated on the 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. The vacuum Breaker shall be Watts LF008PCQT or equal.

2.5 BACKFLOW PREVENTERS

A. Backflow preventers shall be approved by the 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 the building.

C. Each backflow preventive device shall include shut-off valves, two approved check valves, and four properly installed test cocks. Shut-off valves shall be either ball valves or resilient wedged

gate valves. Ball valves shall be used through 2" size. Provide unions for non-flanged assemblies.

D. Provide bronze wye type strainer with stainless steel screen upstream of backflow prevention assemblies where indicated on drawings. The strainer shall have either threaded or flange connections. Threaded units shall have unions on each end for disassembly.

2.6 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 the 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 (20) feet at the end of the branch line between the last two (2) fixtures.

2. Quick closing valves.
3. Lavatories:
   a. When in a battery and up to twenty (20) feet at the end of the branch line.

4. When fixtures in a battery and exceeds twenty (20) feet, provide an additional water hammer arrester midpoint.

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

2.7 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 a 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 per manufacturer's recommendations.

2.8 TRAP SEAL PROTECTION DEVICES

A. The 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 durometers.

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 the General Contractor. This Contractor shall cooperate to connect building facilities where required by the Architect/Engineer to expedite the progress of the work.

3.2 ROOF DRAINS

A. Roof drains shall be clamped under flashing clamp and mopped into roofing. Drains shall be provided with deck clamps as detailed. Drains shall be painted with bitumen where the same is in contact with concrete.

B. Drainage shall be furnished and installed as a complete system including cleanouts.

C. Expansion joints as required shall be properly supported from the roof drain body.

3.3 FLOOR DRAINS

A. All drains above grade shall be flashed with 4 lb. sheet lead clamped under flashing ring extending 18" from the drain in all directions, lead shall be mopped to the structural deck.

B. All drains shall be provided with deep seal p-traps.

C. Set drains to provide drainage of surrounding areas.

3.4 TRAP SEAL PRIMERS

A. Install trip seal primer per manufacturer's recommendations.

B. Ensure that piping is properly flushed before connecting the trap seal primer and distribution unit (when required).

C. Cycle trap seal primers a minimum of six (6) times to ensure optimum performance.

3.5 TRAP SEAL PROTECTION DEVICES

A. Trap seal protection devices shall be installed at the trim-out stage of the project and not before.

3.6 VACUUM BREAKERS

A. The vacuum breaker shall be installed per code and 6" above floor rim, whichever requirement is most stringent.

3.7 WATER HAMMER ARRESTERS

A. Water hammer arresters shall be installed in an upright position.

3.8 STERILIZING AND CLEANUP

A. After the system has been installed completely, the Contractor shall clean all fixtures removing all plaster, labels, etc. All water piping shall be sterilized per these specifications.

3.9 INSPECTIONS, TESTS, AND ADJUSTMENTS

A. During progress and after completion of the work included under this specification, the Contractor shall make all required tests at his own expense in presence of Architect/Engineer as follows and per local codes. The contractor shall furnish all testing instruments, gauges, pumps, etc.

B. All materials shall, as far as possible, be subjected to standard tests by manufacturers before shipment.

C. All tests shall be conducted per System Test And Start-Up specification.

D. Upon completion of work, the Contractor shall obtain and turn over to the Architect certificates of inspection and approval from all City and State Authorities having jurisdiction.

3.10 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 the ceiling access door is accessed when installed above a non-accessible ceiling. The 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

SECTION 22 40 13 - 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 and shower equipment manufacturers are acceptable:
   a. Haws
   b. Acorn
   c. Bradley
   d. Speakman
   e. Guardian
   f. Stingray

2. The following wall hydrant and hose bib manufacturers are acceptable:
   a. Woodford Manufacturing Company
   b. MIFAB
   c. Watts

PART 2 – PRODUCTS

2.1 EMERGENCY SHOWER/EYE WASH:

A. Minimum supply connection shall be:

B. Fixtures shall be:

P-2 Emergency Eye/Face Wash: Floor mounted.

Fixture: Stingray model S2535-NP-NFT-ABNA Barrier-Free, Wall mounted Emergency Face and Eye Wash with dust cover.

Note: Provide Lawler mixing valve model 911EF Thermometer with inlet piping Cabinet mounted on wall. Supply 70-degree tepid water to emergency shower.

2.1 WALL HYDRANTS:

A. Wall hydrant minimum supply 3/4" with backflow preventer and vacuum breaker.

B. Hose bibb minimum supply 1/2" with backflow preventer and vacuum breaker.

C. Fixtures shall be:

P-3 Wall Hydrant (Outside Building): Wall mounted, 24" above finish grade.

Fixture: Woodford Model 67 backflow protected automatic draining freeze less wall hydrant. ASSE Standard 1052 approved.

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.

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

SECTION 22 41 00 - 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 sink manufacturers are acceptable:
   a. Just Manufacturing Company
   b. Elkay Manufacturing Company
   c. Advance Tabco
   d. Kohler
   e. American Standard

2. The following manual faucet and handle manufacturers are acceptable:
   a. T&S Brass and Bronze Works, Inc.
   b. Moen
   c. Krown
   d. Delta Commercial
   e. Chicago
   f. Zurn
   g. Speakman

3. 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 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 manufactured by fixture manufacturer, unless specifically noted otherwise.
7. The color of fixtures shall be white unless specifically noted otherwise.

2.2 UTILITY SINK

A. Utility sink minimum connections shall be 3/8".

B. The utility sink shall be 18 gauge minimum, type 302 stainless steel unless noted otherwise.

C. Fixtures shall be:

P-1 Single Compartment Sink (ADA): stainless steel Freestanding, 27" length x 27" width. 34” from finish floor to fixture rim.

Fixture: Elkay, B1C24X24X (2 hole) 12" depth.

Fitting: T&S Brass, Model B-0330-04 with 4" wrist blades, vandal proof aerator and B-0230-KIT installation Kit.

Drain: Elkay, LKAD35 strainer with Offset Tailpiece, 1-1/2" tailpiece.

Supply: McGuire model 2165 LK.

P-Trap: McGuire Model 8912 - 1-1/2" 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.

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 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 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

SECTION 23 05 01 - 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. Air Conditioning
2. Air Distribution
3. Controls and Instrumentation
4. 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 into 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 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 Engineer shall be notified in writing within ten

(10) working days of the date of delivery of the items. Any claims beyond 10 days will not be considered by the Engineer.

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, 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 are 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. AMCA: Air Moving and Conditioning Association, Inc.
3. ANSI: American National Standards Institute
4. AHRI: Air-Conditioning, Heating, and Refrigeration Institute
5. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
6. ASME: American Society of Mechanical Engineers
7. ASTM: American Society of Testing and Materials
8. MSS: Manufacturers Standardization Society
9. NEMA: National Electrical Manufacturer's Association
10. OSHA: Occupational Safety & Health Administration
11. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

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 Engineer 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 Engineer 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 Engineer. 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 Engineer 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 Engineer, 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 Engineer 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 Engineer 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. Nondurable 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 minimal 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 Engineer.
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 existing duct, pipe, fixtures, equipment and appurtenances are shown on plans to indicate the extent of work required. Exact conditions shall be field verified by the contractor.

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.

1.13 PROJECT COMMUNICATIONS

A. Where it is indicated that communication is with the Engineer or documents are to be transmitted to the Engineer, this is intended that this be done through the prime design professional. If the Architect is the prime design professional, all communication and documentation shall be sent via the Architect.

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 Engineer 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 Engineer 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 Engineer 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 Engineer, 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, conduit, piping, or equipment from metal decks (i.e., metal roof deck w/o concrete), wood decks, etc. 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

SECTION 23 05 02 - 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 shown on the drawings and specified hereinafter.

B. Description:

1. Rooftop curbs shall include all supports for rooftop equipment, pipe, duct, air handling equipment and accessories.

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

3. The following acoustical sealant (gypboard) manufacturers are acceptable:
   a. USG
   b. Approved equal

PART 2 - PRODUCTS

2.1 GENERAL

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 return air or other airstreams that could foul heat transfer surfaces and elsewhere as indicated. Refer to Particulate Air Filtration specification.

B. Seacoast construction shall be provided where specified for a product. Refer to Special Coating specification.

2.2 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 selected by Engineer. Color can be any available color from manufacturer.
4. In addition to prime coat, two finish coats shall be applied.
5. Refer to Identification for HVAC Piping and Equipment specification 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. Supports and accessories where not located in concealed locations.
2. Exposed ductwork

D. Basis of design paint shall be:

1. Glidden Industrial Enamel
2. Sherwin-Williams Industrial Enamel
3. Devoe 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.

2.3 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 shown are minimum sizes but in no case shall they be less than size required by roofing manufacturer.

B. HVAC Ducts and Flues:

1. See detail on plans.
2. Flashing of duct shall be fabricated from 20-gauge stainless steel sheets.

2.4 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.

2.5 DRAINS

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.

2.6 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 ksi

2.7 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 of fire rated assemblies shall meet the requirements of the Firestopping and Smokestopping specification.

C. Color shall be approved by Engineer.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION (SLABS NOT ON GRADE)

A. Submit to the Engineer 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.

3.2 PAINTING

A. All vapor barriers shall be sealed as specified elsewhere in the appropriate sections before painting.

B. All painting shall be completed prior to adding any pipe labels to piping.

C. All conditions that prohibit proper application of paint shall be reported in writing to the Engineer.

D. Submit manufacturer of paint, type, and paint color samples to the Engineer for review.

3.3 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.

3.4 HOUSEKEEPING PADS

A. All exposed surfaces shall be steel troweled smooth with beveled edges.

B. Pad shall be level within 1/16 inch for the length and width of the pad.

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 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 anchored to the structural slab as required by seismic design or as indicated by structural or mechanical details; whichever requirement is greater.

3.5 DRAINS

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.

3.6 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 safety without presenting a hazard to personnel. Terminate with appropriate fitting.

B. Run overflow is similar to drain.

3.7 EXTERIOR SEALANT

A. Submit color charts to Engineer.

3.8 EQUIPMENT PENETRATIONS

A. Seal all openings into equipment resulting from installation of equipment such as conduit and flex.

3.9 EQUIPMENT INSTALLATION

A. Repair all insulation damaged during installation of equipment.

3.10 EQUIPMENT ATTACHMENT

A. Equipment shall be secured to the roof rails, roof curbs, or structure as indicated on the plans. 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

SECTION 23 05 03 - 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 mechanical equipment, piping, duct, and appurtenances where indicated or 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 asse COMMON HVAC MATERIALS mblies as specified hereinafter.
3. All existing utilities, water, steam, chemical treatment, controls, 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 23 equipment, controls, piping, and appurtenances.
2. Remove and dispose of existing HVAC 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 23 specifications apply to this section.

PART 2 - EXECUTION

2.1 GENERAL

A. Post tensioned slabs, beams, columns and other load bearing structures shall not be drilled, cut, or otherwise modified without written approval by the 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 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 PENETRATIONS

A. All round penetrations shall be core drilled. All other penetrations shall be saw cut. Openings shall not be larger than required for proper installation of pipe or duct.

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

SECTION 23 05 53 - IDENTIFICATION FOR HVAC 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 mechanical 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 23 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 band, tag, nameplate, and identification marker manufacturers are acceptable:
   a. Seton Name Plate Corporation
   b. T&B/Westline Products
   c. Brady
   d. MSI
   e. Brimar

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. General:

1. Nameplates shall be black plastic with white engraved lettering.
2. All information shall be provided on a single nameplate per device if practical.

3. Nameplates shall have screw holes and screws for mounting unless screws would damage the intended use of the product to which it is attached (i.e., NEMA4 panel, etc.). In that case, provide stick-on nameplates.
4. Nameplates shall be 1/16" thick.

B. Size:

1. Three-quarter inch (3/4") high nameplate when located on a lay-in ceiling grid.
2. Two inch (2") high nameplate when located on outdoor HVAC equipment.
3. Three-quarter inch (3/4") high nameplate when located on control devices such as switches, sensors, etc.
4. Three-quarter inch (3/4") high nameplates when located on starter, drives, and panels.
5. Size as indicated on plans or detail.

2.2 SWITCHES, THERMOSTATS, AND OTHER SIMILAR DEVICES

A. Devices to be identified include:

1. Control panels
2. Flat plate sensors
3. Similar equipment

B. Nameplate shall include (example):

1. Equipment description: HV #1, etc.
2. Switch position as required: Summer/Winter, On/Off, etc.

2.3 MECHANICAL EQUIPMENT

A. Devices to be identified include all mechanical equipment.

B. Where equipment is located above a lay-in ceiling, a nameplate shall also be provided on the metal grid in close proximity to the equipment.

C. Nameplate shall include (example):

1. Equipment description: EF #1, etc.
2. Owner's identification number

2.4 CEILING LOCATION MARKERS

A. Provide nameplates to indicate location of equipment and devices located above the ceiling.

B. Equipment shall include:

1. VAV terminal units
2. Fans

PART 3 - EXECUTION

3.1 CEILING LOCATION MARKERS

A. After Engineer approval, attach nameplate to ceiling grid as close to device as practical.

3.2 NAMEPLATES

A. Submit listing of all nameplates with associated information to the Engineer for approval before fabrication.

B. Coordinate method of attachment and location of nameplate with contractor who is responsible for the installation of the device (i.e., control panel, air handler, etc.).

END OF SECTION

SECTION 23 05 92 - 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 23 0593 - 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 Engineer, 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 Engineer 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. Heating and air conditioning equipment
2. Air handlers
3. Dust collection equipment

C. The following systems shall be started up by a factory technician:

1. 100% Outside air equipment

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.

D. Leakage tests for systems greater than 2-inch w.g.:

1. Duct shall be tested in accordance with SMACNA Duct Leakage Test Procedures.
2. The duct leakage class for rectangular duct and round flexible duct is Class 6.
3. The duct leakage class for round and flat oval duct is Class 3.
4. The duct leakage permitted for welded duct is 0.5% maximum.
5. Leakage testing shall be provided on all risers and all concealed ducts. Testing shall also be provided on a minimum of 25%, by length, of all other duct on each system.
6. Leakage tests shall be repeated until the duct is proven to be within the limits of leakage specified herein.

E. Leakage tests for systems used in smoke control:

1. In addition to the requirements in this section, refer to Smoke Control System specification for additional requirements.

2.4 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. 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 and fire and smoke 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.

2.5 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 Engineer 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 construction 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 Engineer 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

SECTION 23 05 93 - 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 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. Hydronic systems (heating and cooling systems)
   c. Domestic water systems
   d. Condensate systems
   e. Vibration isolation systems
   f. Cooling tower airflow

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 23 0592 - 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

c. NBC Standards

2. Testing and balancing shall be performed by an agency certified by the AABC, NEBB, or the National Balancing Council.
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 Engineer.

C. If, for any reason, a system cannot be properly balanced, it shall be reported to the Engineer by the Test and Balance Agency as soon as observed.

D. Should additionally, 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 Engineer 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, dehumidification, 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. Temperature Control Dampers (Automatic):

1. All temperature control dampers shall be verified by the Test and Balance Agency for proper shut-off when driven closed by the controller. Dampers shall also be verified to be in the same position as indicated by the controller.

I. 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.

J. 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.

K. Drum Louvers:

1. Louvers shall be adjusted (rotate drum, adjust louver position) to provide maximum coverage of (exterior glass) (area served).

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, valves, and other controlled devices are operated by the intended controller.
4. Verify that all dampers and valves are in the position indicated by the controller (open, closed, or modulating).
5. Verify the integrity of valves and dampers in terms of tightness of close-off and of full-open position. This includes dampers in multizone units, mixing boxes and VAV terminals.
6. Check that all valves are properly installed in the piping system in relation to direction of flow and location.
7. Check the calibration of all controllers.
8. Verify the proper application of all normally open and normally closed valves.
9. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.
10. 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.
11. 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 except where specified. Observe that heating cannot take place at VAV reheat terminals until the unit is at minimum CFM.
12. Verify that all controller set points meet the design intent.
13. Check all dampers for free travel.
14. Verify the operation of all interlocked systems.
15. Perform all system verification to assure the safety of the system and its components.

2.5 EXISTING SYSTEMS

A. General:

1. All hydronic and air systems which are to remain but are modified in any manner or are listed to be tested shall be tested before demolition begins.
2. The test and balance contractor shall utilize an ultrasonic meter to measure existing water flows where existing water flows are to be measured. If there are proper flow measuring devices installed, the test and balance contractor may use the installed devices.

3. Where ultrasonic meters are used on existing insulated systems, the contractor shall remove insulation as needed and repair insulation and finish to match existing when testing is completed.

B. Balancing Requirements

1. The Engineer shall provide direction on any changes to be made to the existing equipment's air or water balance. After renovation work is completed, the existing equipment shall be rebalanced or, if no changes are required, equipment shall be retested.

C. Locations shall include, but not be limited to, the following:

1. Equipment airflows indicated on the plans.
2. Fan total flow and pressure.
3. Air flow at points where new duct ties in.
4. Other requirements where indicated on the plans or elsewhere in the specifications.

D. Reports:

1. A test and balance report shall be submitted before demolition and after renovation is completed for all systems which are required to be measured.

2.6 TEMPERATURE MEASUREMENT

A. General:

1. Air and water temperatures at hydronic coils must be taken in the same relative timeframe. For example, when measuring coil entering and leaving air temperatures, the coil entering and leaving water temperature must be taken in close timeframe to the measurement of the air.
2. 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.

B. Air Temperatures:

1. Provide entering and leaving air temperatures for each cooling coil, heating coil, energy recovery and heat transfer device.
2. Temperatures shall be measured in heating, cooling, dehumidification, and neutral modes of operation.
3. Temperature measurements at the following devices shall be provided only downstream of the device:
   a. Terminal units
   b. Laboratory supply valves
   c. Heaters (non-ducted)

PART 3 - EXECUTION

3.1 SUBMITTALS

A. The Contractor shall submit to the Engineer 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 Engineer 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 Engineer within the specified times, the Engineer 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, water systems, vibration, etc.

D. Reports shall be submitted after all modifications required by these specifications to balance system (i.e., replacing 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.
2. Locations of all required sound and vibration measurements.

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 Engineer.

B. The Test and Balance Agency shall perform construction inspections at the following stages of each construction phase and submit comments to Engineer:

1. 50% completion
2. 90% completion

3.6 BELTS, DRIVES, IMPELLERS 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.

B. Drives for constant volume air handlers shall be selected for a minimum of 100% filter loading.

C. Drives for variable volume air handlers shall be selected for a minimum of 100% filter loading.

D. If it is determined by the Test and Balance Agency that impeller changes are required, the Contractor shall change impellers.

E. If it is determined by the Test and Balance Agency that additional balance dampers are required, the Contractor shall install additional dampers.

F. The Test and Balance Agency shall rebalance system after changes have been made.

3.7 ENGINEER REVIEW

A. The Engineer shall, at their 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 Engineer'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 EXISTING SYSTEMS

A. Pre-demolition test report shall be submitted before demolition begins.

B. Balance systems as directed by Engineer after renovation work is completed and provide renovation test report.

3.9 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

SECTION 23 09 00 - 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 23 0904 - Building Automation System

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 Electrical 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 Detectors

B. Control circuit wiring shall meet NFPA Standard 70, Article 725, for remote control, low energy power, low voltage power and signal circuits.

C. All control equipment shall be the product of one manufacturer whenever practical.

D. Manufacturers:

1. The following Building Environmental Controls Contractors are acceptable:
   a. Trane, Columbia, SC

2. The following control manufacturers are acceptable:
   a. Trane

PART 2 - PRODUCTS

2.1 GENERAL

A. The building environmental controls shall be provided by the Building Environmental Controls Contractor.

B. 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.

C. 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.

D. The Building Environmental Controls system shall be installed by competent controls mechanics who are full-time employees of the Building Environmental Controls Contractor.

E. The Building 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.

2.2 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 all control devices, panels, components, and the following equipment unless specifically shown on electrical plans:

1. Control devices
2. Motorized dampers

D. The control system shall be on normal power.

2.3 CONDUIT

A. General:

1. All control conduit shall be furnished and installed under this division except where specifically indicated otherwise.
2. All line voltage and control wiring in new construction shall be run in conduit.
3. All control wiring in existing construction 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.
5. Outdoor conduit shall be GRC.
6. Indoor conduit shall be EMT.
7. Conduit shall be 3/4".

B. Below slab or below grade conduit:

1. 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.
2. All metallic conduits installed below slab or below grade shall be provided with watertight couplings.
3. 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. Exposed Conduit (Indoor):

1. All exposed conduit shall be prepainted conduit.
2. Conduit shall be prepainted color to be selected by Owner.

2.4 CONTROLS WIRING

A. Wiring for low voltage circuits generally shall be No. 18B and S gauge or larger RSH-2 heat resistant.

B. 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.

C. Cables carrying a-c circuits sensitive to external fields shall be shielded.

D. 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.

E. Cables shall terminate in solder or screw type terminal strips. All terminal strips shall be numbered.

F. Cables shall not be tapped at intermediate points.

G. All wires, whether individual or in cables, shall be color coded and numbered for identification in accordance with the National Electrical Code.

H. Wire, where specifically permitted to be installed without conduit, shall be plenum rated.

2.5 TRANSFORMERS

A. Transformers shall be furnished and installed for supplying current to control equipment as required.

B. 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.

2.6 CONTROL VOLTAGE

A. Voltage shall not exceed 24V.

2.7 SPEED SWITCHES

A. Speed switches, rheostats, and other fan speed control devices may be furnished by either the equipment manufacturer or the controls contractor.

2.8 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.
4. Thermostats shall be 24V.

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.

2.9 DDC THERMOSTATS

A. General:

1. The electronic thermostat shall allow the following functions:

a. Temperature setpoint adjustment.
b. Override switch (from unoccupied to occupied).

2. The electronic thermostat shall allow the following to be programmed from the building control system:
   a. Space occupied and unoccupied temperatures.
   b. Space occupied and unoccupied times.
   c. Allowable space setpoint adjustment.
   d. Length of override duration.

3. The electronic thermostat shall have the following features:
   a. Digital display.

4. Thermostats shall connect to unit controller via communication cable with a standard jack. The thermostat shall also have a connection available for field monitoring.
5. 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: ± .34 deg F @ 70 deg F (thru film nickel)

2.10 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 and both are providing input for the same piece of equipment, a combination humidity transmitter and temperature sensor may be provided at the contractor's option.
5. The humidistat shall be a separate device from other control sensors/devices when input is not used to control one specific piece of equipment.

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: ± 3% RH for 20-80% RH
   ± 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: ± 5

2.11 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.).

2.12 SAFETY DEVICES

A. General:

1. Safety devices including, but not limited to, the following shall be hard wired to perform their required function:
   a. Freezestat
   b. Condensate overflow switch
   c. Duct high (and low) pressure switch(es)
   d. Smoke alarm, via unit duct detector, where shutdown sequence is specified to be by mechanical.

2. Status, where specified, shall be monitored by the building automation controls system and initiate other sequences where required.

2.13 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 indicated on plans, approved by Engineer, 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.

2.14 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. Basis of design manufacturers shall be:

1. SMD Research Safe-T-Switch Model SS3.

2.15 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.

2.16 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. The (Building Environmental Controls Contractor (mechanical 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 thermostats, sensors, and switches 4'-0" above finished floor to the top of the device’s control mechanism unless noted otherwise.
2. Mount humidity sensors 7'-0" above finished floor unless noted otherwise or when a combination temperature and humidity sensor is permitted.
3. Thermostats mounted on exterior walls shall be mounted on a thermally insulated sub-base.
4. When location is not shown, Contractor shall assume the most remote location served by unit. Coordinate exact location with Engineer.
5. 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 WIRING

A. All control wiring within starters (and motor control centers) shall be installed in a workmanlike manner and neatly laced.

B. All wiring installed in manholes, below grade, or below ground water level shall be made up with waterproof connections.

C. Wiring in manholes shall be continuous thru manholes.

3.5 CONDUIT

A. Conduit sleeves thru non-waterproofed walls and floors shall be grouted and caulked on both sides of the wall and floor. See detail for fire rated or smoke tight assemblies.

B. After installation, any painted pipe which is damaged shall be touch-up painted.

3.6 EXISTING CONSTRUCTION

A. Control wiring and conduit shall be installed in existing walls, slabs, and ceilings.

B. 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.

C. 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.

3.7 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.

3.8 SPEED SWITCHES

A. If switch is not factory installed on the unit, the control contractor shall field install the switch.

3.9 FLOAT SWITCH

A. Secure bracket to drain pan with screw.

B. Verify float is properly positioned.

END OF SECTION

SECTION 23 09 04 - 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 23 0900 - 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. Trane

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. Chilled water reset
   h. Hot water reset
   i. Occupied/Unoccupied mode
   j. Chiller optimization

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. Chiller/condenser water systems
6. Boiler system
7. Each heating and cooling unit
8. Each 100% outside air system
9. Each terminal unit
10. Each exhaust fan
11. Ambient conditions
12. Smoke zones
13. Fireman's Smoke Control system

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 and hardware 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 facilities (in the District) 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 CHILLER COMMUNICATION

A. Building automation system must be able to fully communicate and change setpoints with chillers. Communication must be direct without gateway or other external translating devices.

2.11 BACK-UP POWER

A. Provide an UPS for all panels in this specification.

2.12 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.

3.2 CONSTANT AND VARIABLE AIR VOLUME TERMINAL UNITS

A. The control contractor shall ship the controllers required for operation of the terminal units to the terminal unit manufacturers facility for factory installation of the controllers on to the terminal unit.

B. The control contractor shall be responsible for all costs to package, insure, and ship the controllers to the location required by the terminal unit manufacturer.

3.3 EXISTING EQUIPMENT

A. The tags (name) of existing equipment have been changed to be consistent with other District projects. See the existing equipment schedules.

3.4 SYSTEM COMMISSIONING

A. This project will include system commissioning by the District's commissioning agent. A major component of this commissioning will include a detailed review of system operation.

B. The controls contractor shall fully support the commissioning work on this project. See specification 01 9113 for additional requirements.

END OF SECTION

SECTION 23 09 93 - 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 23 0900 - Instrumentation and Control for HVAC (General)
2. Section 23 0993.1 - Sequence of Operation (Central Air Handling Equipment)
3. Section 23 0993.2 - Sequence of Operation (Air Handling Equipment)
4. Section 23 0993.3 - Sequence of Operation (Hydronic Systems)
5. Section 23 0993.4 - Sequence of Operation (Electric Heaters)
6. Section 23 0993.5 - Sequence of Operation (Hydronic Heaters)
7. Section 23 0993.6 - Sequence of Operation (Single Zone Packaged Equipment)
8. Section 23 0993.7 - Sequence of Operation (Water Source Heat Pump Systems)
9. Section 23 0993.8 - Sequence of Operation (100% Outside Air Equipment)
10. Section 23 0993.9 - Sequence of Operation (Various Systems)
11. Section 23 0993.10 - Sequence of Operation (Water Heaters/Domestic Water Systems)
12. Section 23 0993.11 - Sequence of Operation (Self-Contained Water-Cooled Equipment)
13. Section 23 0993.12 – Sequence of Operation (Energy Recovery Ventilation Equipment)
14. Section 23 0993.13 – Sequence of Operation (Steam Systems)
15. Section 23 0993.14 – Sequence of Operation (Laboratory Systems)

PART 2 - SEQUENCE OF OPERATION

2.1 GENERAL:

A. These sequence descriptions and definitions shall apply to all sequences unless sequence specifically indicates otherwise.

2.2 SETPOINTS

A. In general, the specification indicates setpoints or range of setpoints for most devices.

B. Temperatures shall be field settable to any temperature.

C. Time of day operations shall be field settable to any time.

D. Time delays shall generally be field settable as follows:

1. 0-60 second delay: settable from 0-300 seconds.
2. 0–5-minute delay: settable from 0-60 minutes.

E. 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 Engineer prior to initiating the schedule.

2.3 MORNING COOL-DOWN

A. 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.

B. This mode will operate with outside air systems closed or de-energized.

C. 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 cool down the building.

2.4 MORNING WARMUP

A. 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.

B. This mode will operate with outside air systems closed or de-energized.

C. 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 the building.

D. Where acceptable to the Engineer, morning warmup may be based upon indoor and outdoor temperatures as follows:

1. Outdoor temperature 0-15 degrees below space occupied setpoint, morning warmup start 30 minutes before occupied time.

2. Outdoor temperature 16-25 degrees below space occupied setpoint, morning warmup start 60 minutes before occupied time.
3. Outdoor temperature 26-35 degrees below space occupied setpoint, morning warmup start 90 minutes before occupied time.
4. Outdoor temperature is more than 35 degrees below space occupied setpoint, morning warmup start 120 minutes before occupied time.

2.5 NIGHT SETBACK

A. This mode is the unoccupied mode.

B. This mode is a timed function of adjustable duration.

C. 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).

D. All HVAC equipment required to maintain space conditions shall be energized in this mode.

2.6 OVERRIDE

A. When override is activated, the system shall operate with that zone, equipment, or system in the occupied mode.

B. At the end of the override time period, the zone equipment or system shall return to the mode scheduled at that time.

2.7 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.

2.8 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 is 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. Low Temperature (Recirculating System):

1. A low temperature condition may be caused by coil freezestat, mixed air low limit or leaving air low limit.
2. Unless sequences specifically identify alternative modes of operation, the following shall be provided:
   a. The system shall operate in occupied mode.
   b. Outside air dampers shall be closed or outside air supply fans shall be de-energized.
   c. Heating system shall energize including heat sources and distribution system.
   d. Cooling distribution system shall energize.
   e. Loop water system shall energize.
   f. (Heating) (Cooling) valves shall fully open to coil.
3. (Alarm shall be indicated at building automation system.) (Building freeze alarm shall sound.)

D. Low Temperature (Outside Air System):

1. A low temperature condition may be caused by coil freezestat, mixed air low limit or leaving air low limit.
2. Unless sequences specifically identify alternative modes of operation, the following shall be provided:
   a. The system shall operate in recirculation mode (if one is specified) or shall de-energize.
   b. Outside air dampers shall be closed.
   c. Heating system shall energize including heat sources and distribution system.
   d. Cooling distribution system shall energize.
   e. Loop water system shall energize.
   f. (Heating) (Cooling) valves shall fully open to coil.
3. (Alarm shall be indicated at building automation system.) (Building freeze alarm shall sound.)

E. High Condensate Level:

1. Upon a rise in condensate level in the condensate pan, the float switch shall de-energize the unit.

F. Duct Pressure:

1. Discharge, (exhaust) (and return) air static pressure sensors shall de-energize fans.

2.9 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

2.10 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.

2.11 EQUIPMENT ON EMERGENCY POWER

A. When building operates on emergency power, the following HVAC systems shall continue to operate (see individual system sequences for changes in operation, if any, from normal power to emergency power):

1. Control associated with:
   a. Building heating system and steam system
   b. Glycol water system
   c. Laboratory supply and exhaust air flow
   d. Vivarium supply
   e. Exhaust air flow
   f. Tower basin heater

2. Chillers:

3. Pumps:

4. Condensate pumps:

5. Boiler feed system:

6. Ventilation fans (EF-# and SF-#) and associated dampers:

7. Stair pressurization systems:

8. Smoke control system:

9. Laboratory exhaust fans:

10. Vivarium exhaust fans:

11. Air handlers:

12. Cooling tower basin heater:

13. Controls air compressor and refrigerant dryer:

14. Vivarium control system:

15. Laboratory control system:

16. Other devices and equipment where indicated on plans or specifications:

17. Heat Tape:

2.12 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 necessary, 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.

2.13 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).

2.14 REMOTE NOTIFICATION

A. Critical alarms shall be sent via text and/or email to up to six (6) Owner identified recipients.

2.15 TWO SPEED MOTORS

A. Sequence shall include a time delay on two speed motors when changing from high speed to low speed.

PART 3 - POINT SCHEDULE

3.1 DEFINITION OF POINTS

A. Binary Output:

1.	Control Relay	- Energize/de-energize
2.	Solenoid	- Steam Valve Gas Valve
3.	Hand/Off/Auto	- Starter

B. Analog Output:

1.	Cooling	- Control Valve
2.	Heating	- Control Valve SCR Heater
3.	Humidification	- Control Valve
4.	Economizer	- Dampers
5.	Position Adjust	- Fan Drives Pump Drives Dampers VAV Damper

C. Binary Input:

1.	Differential Pressure	- Fan Status Pump Status
2.	Pressure Switch	- Pressure
3.	Flow Switch	- Fan Status Pump Status
4.	Fire/Smoke	- Smoke Detector Fire Sensor
5.	Freeze	- Low Limit
6.	Filter	- Filter Pressure
7.	Setback Override	- Night Setback 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

END OF SECTION

SECTION 23 09 93.2 - 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 23 0993 - Sequence of Operation for HVAC Controls and Points List

PART 2 - SEQUENCE OF OPERATION

2.1 TERMINAL BOXES

A. Terminal Box Controls

1. The terminal boxes shall be controlled by a unit mounted direct digital controller.

B. Airflow

1. A pressure independent controller shall modulate air valve to maintain airflow set point.
2. Two position boxes shall maintain a minimum CFM when switch is in "Unoccupied" position.
3. Heating Airflow
   a. When air handler is in cooling mode and space heating is required, the terminal unit shall provide minimum scheduled heating airflow.
   b. When the air handler is in heating mode and no terminal unit is in cooling mode, the terminal unit shall provide the maximum scheduled heating airflow. If a maximum heating airflow is not indicated on the schedule, airflow shall be 80% (adj.) of cooling airflow or minimum heating airflow, whichever is greater.

C. Temperature Control

1. General
   a. Space temperature control shall be by a space sensor with adjustable set point. Provide a night setback override.
   b. When the terminal unit is in heating mode and the space temperature has been satisfied, the electric heat shall proportionally energize to maintain the supply air at

a temperature equal to the space setpoint (i.e., supply air at a neutral temperature).

c. Occupied space setpoint shall be 72 degrees F (adj.).

d. Unoccupied space setpoint shall be 80 degrees F (adj.) in cooling mode and 55 degrees F (adj.) in heating mode.

2. Shutoff Terminal Units

a. Airflow shall modulate to minimum or full shut off position when space temperature decreases below set point.

b. Electric heating coil shall proportionally energize upon a further drop in space temperature.

D. Override

1. When terminal unit is in override setback mode, the primary air system and terminal units shall operate in occupied mode.

E. Morning Warm-up

1. When system operates in morning warm-up mode, the primary air system shall energize.
2. The non-fan powered terminal units shall operate at maximum heating airflow if space requires heating and minimum airflow if heating is not required for the space.
3. Fan powered terminal units shall operate with primary air closed and in heating mode.
4. When space temperature is satisfied, and the building is in occupied mode, the terminal unit shall revert back to normal operating sequence.

2.2 EXHAUST FANS

A. Fans shall be controlled as shown on the schedule.

END OF SECTION

SECTION 23 09 93.6 - 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 23 0993 - 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, reheat 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 occupied or override modes, 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.
2. If additional heat is required or the compressor fails to energize, the auxiliary heat shall be energized.
3. Electric heat shall be energized during the defrost cycle.
4. Electric heat shall stage (single or multiple) or proportionally energize as indicated on equipment schedule or specifications to maintain sensor setpoint.

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. Outside Air Damper:

1. The outside air damper shall be closed during unoccupied mode.
2. The outside air damper shall be closed during morning warm-up mode.
3. The outside air damper shall be open during occupied mode.

G. 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.
3. When the space humidity rises above setpoint, the system shall operate in dehumidification mode.

H. Failure Mode:

1. High condensate level
2. Smoke detection
3. Freezestat
4. Others indicated with equipment or required by manufacturer.

2.2 PACKAGED COOLING AND HEATING UNITS (WITH HOT GAS REHEAT)

A. Unit Operation:

1. The units shall be controlled by a (space) thermostat, (space humidistat) and direct digital controller.

B. Dehumidification Mode:

1. The unit shall operate in cooling mode when humidity level exceeds setpoint.
2. The hot gas reheat valve shall modulate to maintain the space temperature setpoint.

END OF SECTION

SECTION 23 31 12 - 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 23 3300 - Duct Accessories
2. Section 23 3313 - Dampers
3. Section 23 3346 - 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 0 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. The following shall not require sealant:

1. Spiral lockseams
2. Gasketed connections

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.

B. Advanced Level (SMACNA):

1. Ducts leaving the place of fabrication shall be wiped clean (interior) and have all ends capped.

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. Installing 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 Engineer 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 excessive air leaks through joints, at reinforcement locations, seams, points of connection with fire dampers, coils, or other duct accessories. Where there are unacceptable leaks, the leakage shall be repaired and shall be done so in the manner of a new installed system. Excessive air leaks shall be leaks that exceed industry standards, cause higher than acceptable noise, or where leakage exceeds reasonable expectations.

END OF SECTION

SECTION 23 31 13.1 - 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 23 3112 - 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. Grease duct doors shall be UL 1978 listed.

E. Manufacturers:

1. The following round and flat oval 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

2. The following grease duct cleanout door manufacturers are acceptable:
   a. Ductmate Industries, Inc.
   b. Approved equal

3. The following surface mounted duct support manufacturers are acceptable:
   a. Mifab
   b. MIRO
   c. Approved Equal

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. are located on roofs, exterior of the building, or other locations where exposed to the weather shall be stainless steel.
3. The dryer vent system located outdoors shall be stainless steel.
4. The fume hood exhaust duct shall be stainless steel.
5. The kiln exhaust duct located outdoors 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 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 continuously 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 ROUND AND FLAT OVAL DUCT (DUAL WALL)

A. Duct:

1. Duct shall be constructed with spiral lockseams or spiral lockseams/standing rib.
2. Dual wall shall be:
   a. Indoor supply and return: 2"
   b. Outdoor supply: 3"
   c. Outdoor return: 2"

B. Materials:

1. Outer wall galvanized (indoor)
2. Outer wall stainless steel (outdoor)
3. 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. Round and flat oval dual wall duct shall have perforated liner.
2. Fittings shall have solid liner.

E. Insulation:

1. Insulation shall be .27K @ 75 degrees F.
2. Insulation shall be thickness of the dual wall.
3. A 1 mil (min.) polyester film shall be provided between the fiberglass insulation and airstream to prevent fibers from contacting the airstream where perforated liners are provided.
4. The insulation and film shall have a flame and smoke spread of less than 25/50.

F. Location:

1. Dual wall duct shall be provided in the following locations:
   a. As indicated on plans.

2.4 RECTANGULAR DUCT (DUAL WALL)

A. Duct:

1. Dual wall shall be:
   a. Indoor supply and return: 2"
   b. Outdoor supply: 3"

c. Outdoor return: 2"

B. Materials:

1. Outer wall galvanized (indoor)
2. Outer wall stainless steel (outdoor)
3. 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 (perforated liner) (solid liner).

E. Insulation:

1. Insulation shall be .27K @ 75 degrees F.
2. Insulation shall be thickness of the dual wall.
3. A 1 mil (min.) polyester film shall be provided between the fiberglass insulation and airstream to prevent fibers from contacting the airstream where perforated liners are provided.
4. The insulation and film shall have a flame and smoke spread of less than 25/50.

F. Location:

1. Dual wall duct shall be provided in the following locations:
   a. As indicated on plans.

2.5 DUST COLLECTION SYSTEM

A. All duct accessories and supports used for dust collection systems, rectangular and round, shall be 14-gauge type 304L stainless steel.

B. Exterior joints shall be heliarc welded, grounded, and polished to match the finish on the duct.

C. Fittings to make connections to duct or equipment shall be custom-made to meet field conditions.

D. Provide stainless steel flanges to terminate duct or to connect to source capture duct.

E. Stainless steel ducts shall be used on the following systems:

2.6 EXPOSED DUCT

A. All exposed galvanized duct (in non mechanical room spaces) shall be factory or shop paint grip duct.

2.7 LOW PRESSURE RUNOUTS

A. Where concealed, single wall, low pressure runout ducts are indicated, they may be snap lock duct provided all of the following conditions are met:

1. Ducts 12" round or 12" x 12" and smaller.
2. Runout to a single air distribution device.
3. Less than 15 feet in length.
4. No other specific type of duct is specified.
5. Duct shall be 26 gauge minimum.
6. Snap lock duct free area is equal to or greater than duct specified.
7. Duct does not run through a wall or partition.
8. Duct is not exposed.

2.8 ROUND DUCT FITTINGS (FOR EXPOSED DUCTS)

A. General:

1. Exposed ducts shall have gasket fittings.
2. Seal shall be a triple lipped EPDM rubber gasket.
3. The finish shall match the round duct.

B. Gasket:

1. SMACNA Class 3 leakage for -2” WG to +10”WG
2. Temperature rating from -20 degrees F to 212 degrees F
3. Smoke and flame spread rating of 0/0 per ASTM E84

2.9 GRILLE BOXES (FOR EXPOSED DUCTS)

A. General:

1. Grille boxes shall be suitable for approved grille and size to be minimum size of the overall grille dimension.
2. Grille boxes shall be factory installed on the duct.
3. Grille boxes shall match the duct finish.
4. Spacing of supports shall be no greater than specified for duct supports or as indicated on plans, whichever is less.

PART 3 - EXECUTION

3.1 ROUND AND FLAT OVAL 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:

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. Fabricate plenums connecting to existing louvers only after field verification of existing louver size.

3.4 DUCT DRAWINGS

A. Provide 1/4" scale CADD drawings indicating layout of all dual wall duct.

B. Where new duct ties into existing duct, existing duct must also be shown based upon field verified dimensions.

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 handheld 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.

3.8 ROUND DUCT FITTINGS (FOR EXPOSED DUCT)

A. Secure fittings per SMACNA requirements or #10 TEK screw minimum.

END OF SECTION

SECTION 23 33 00 - 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 23 3112 - 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. SMACNA
   d. ASTM E84
   e. AMCA Standard 500

2. Duct accessories shall have AMCA Certified Rating Seal when specified.

B. Manufacturers:

1. The following flexible duct connector manufacturers are acceptable:
   a. Ventfabrics
   b. Ductmate
   c. Approved Equal

2. The following test cap manufacturers are acceptable:
   a. Ventlok
   b. Approved equal

3. The following strap hanger clamp manufacturers are acceptable (for use where seismic restraints are not required):
   a. Caddy
   b. Approved equal

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. Fabric used in indoor applications shall meet NFPA 90A and 90B.
3. Fabrics shall meet NFPA 701.
4. Connectors shall be unaffected by mildew, resistant to weather and have a fire-retardant coating on a noncombustible fabric.
5. Connector shall be suitable for -40-degree F to 180-degree F.
6. Where duct has roll formed mating flange, metal strips shall be roll formed.

B. Indoor Applications:

1. Characteristics:
   a. Fabric: glass cloth
   b. Weight: 30 ± 2 oz/sq. yd.
   c. Tongue Tear: 40/30 lbs.
   d. Tensile Strength: 395/255 lbs.

2. Metal strips shall be galvanized or aluminum.
3. Metal strips shall be 3" minimum, and fabric shall be 5" minimum.
4. Basis of design manufacturer shall be:
   a. DuctMate Proflex Neoprene

C. Locations:

1. Inlet and outlet of each duct at all equipment with a fan except grease exhaust fans.
2. Outlet of nonfan powered terminal units where required by seismic design.
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 except where low leak duct access doors are required.

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.

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. Basis of design clamps shall be:

1. CADDY Strap Hanger Clamps or similar

PART 3 - EXECUTION

3.1 FLEXIBLE DUCT CONNECTORS

A. Installed length of material shall be 50% flat length.

3.2 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

SECTION 23 33 13 - 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 23 3112 - 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 positive locking damper manufacturers are acceptable:
   a. Rossi
   b. Ventfabrics
   c. Durodyne

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 to blade for dampers 14 inches and higher.
3. Bearings shall be non-corrosive, non-stick type and shall be molded synthetic Cycoloy 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. 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. Positive Locking Damper Mechanism:

1. The damper mechanism for all manual dampers shall lock the damper in position.
2. The locking mechanism shall not release the damper position due to vibration. Wing nuts are not acceptable.
3. Basis of design manufacturer:
   a. Rossi Everlock Damper Handle

D. 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. Basis of design manual balance dampers manufacturer:
      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. Basis of design low pressure manual balancing damper (round) manufacturer:
      1) Ruskin MDRS25
3. Medium Pressure (Round and Oval):
   a. Frame and blades shall be galvanized steel construction. Frame shall be minimum 14 gage for dampers with largest dimensions under 24 inches. Dampers with any dimension greater than 24 inches shall be 3/16" steel. Blades up to 18 inches shall be 12 gage. Blades greater than 18 inches shall be 10 gage.
   b. Maximum pressure differential shall be 4 inches W.G.
   c. Basis of design medium pressure manual balance dampers (round) manufacturer:

1) Ruskin CDR25

d. Basis of design medium pressure manual balance dampers (oval) manufacturer:
1) Ruskin CDO25

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Fire and Smoke Dampers:

1. Indicate system static pressure and damper dynamic rating (static pressure and airflow) for airflow direction required.

3.2 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. Damper actuator shall be installed on duct or fixed structure. Mounting on gypsum walls or similar structures is not permitted.
3. 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 the blade seals.

END OF SECTION

SECTION 23 36 00 - AIR TERMINAL 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 air terminal units 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

B. Manufacturers:

1. The following variable and constant volume air terminal manufacturers are acceptable:
   a. Trane
   b. Tempmaster
   c. Envirotec
   d. Metal Aire
   e. JCI
   f. EH Price
   g. Nailor
   h. Titus
   i. Warren

PART 2 - PRODUCTS

2.1 VARIABLE AND CONSTANT VOLUME AIR TERMINALS

A. General:

1. Provide single duct terminal units with capacities as scheduled on drawings.

B. Construction:

1. Terminals shall be constructed of 22-gauge zinc coated steel casings.
2. Insulation characteristics:
   a. Insulation shall have an R value of 3.5 minimum.
   b. Rigid fiberglass insulation shall be 2.0# density minimum.
   c. Closed cell insulation shall be 4# density.

3. Insulation shall be one of the following:
   a. Closed cell insulation.
   b. Aluminum foil faced rigid fiberglass with taped edges.
   c. Metal liner (dual wall). Internal insulation shall be rigid fiberglass insulation or closed cell type.

4. Terminals shall be complete with inlet and outlet collars.

C. Electrical:

1. Electric heater disconnect with fuse
2. Control power transformer

D. Heating:

1. Heaters shall be listed by the manufacturer as an SCR heater.

E. Accessories:

1. Air flow switch
2. Factory hanger brackets

PART 3 - EXECUTION

3.1 VARIABLE AND CONSTANT VOLUME AIR TERMINALS

A. Shop drawing submittals shall include sound ratings on all boxes. Submit data on 2nd through 7th octave bands based upon 2" W.G. and specified maximum CFM.

B. Orders for equipment shall not be processed by the manufacturer until the contractor verifies LH/RH configuration based upon contractor coordination drawings.

3.2 TERMINAL UNIT CONTROLS

A. The variable and constant volume air terminal unit manufacturer shall factory install the DDC controller furnished by the control vendor. The control vendor shall be responsible for shipping the controllers to the location required by the air terminal unit vendor.

3.3 SUBMITTALS

A. If a field installed filter rack is provided, submit the filter rack shop drawing.

B. Based upon duct coordination drawings, the contractor shall submit shop drawings indicating left hand or right-hand configuration to provide maximum clearance to control and power panels.

END OF SECTION

SECTION 23 37 13 - 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. Return air and exhaust air units in same space with supply shall match supply in style and type.
3. 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.
4. Provide round to square adapter for flex duct connecting to square neck.
5. 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. Fire rated assemblies: steel.
4. 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 a 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" with 18" x 18" (min.) louver face 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 a 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 ACOUSTICAL CEILING UNITS (PLAQUE DIFFUSERS)

A. Acoustical ceiling air distribution units shall be plaque diffusers with 360-degree radial diffusion and removable face panel.

B. Face panel shall have smooth edges and rounded corners.

C. Back cone shall be one piece without corner joints.

D. Frame style shall be compatible with ceiling type.

E. Surface mounted panels shall be 12" x 12" for 8" round or 8" x 8" neck sizes and smaller.

F. Unit for lay-in ceiling shall be 24" x 24" unless specified otherwise.

2.5 HARD OR MONOLITH CEILING UNITS (PLAQUE DIFFUSERS)

A. Hard or monolithic ceiling air distribution units shall be plaque diffusers with 360-degree radial diffusion and removable face panel.

B. Face panel shall have smooth edges and rounded corners.

C. Back cone shall be one piece without corner joints.

D. Frame style shall be compatible with ceiling type.

E. Surface mounted panels shall be 12" x 12" for 8" round or 8" x 8" neck sizes and smaller.

2.6 SIDE WALL UNITS

A. Side wall air distribution units shall have a removable-reversible four position louvered core, closely spaced horizontal face deflecting vanes, and vertical rear deflecting vanes individually adjustable.

B. Vanes shall be 14 gauge.

2.7 DRUM LOUVERS

A. Drum louver shall be heavy gauge aluminum construction suitable for mounting directly to round spiral duct without the use of transitions or taps.

B. Drum rotation shall be 25 degrees (min.) either side of the louver centerline.

C. Louver vanes shall be spaced at three (3) inches (max.).

D. Accessories include:

1. Mounting screws
2. Gasket
3. Damper

2.8 DIFFUSERS FOR ROUND DUCT:

A. Grilles shall be designed to be installed directly on round spiral duct.

B. Grille shall be curved to match the radius of the round duct.

C. Adjustable blades with 3/4" spacing.

D. Construction:

1. Aluminum
2. .03" minimum blade thickness
3. .05" minimum frame thickness with countersunk holes

E. Accessories:

1. Curved end caps
2. Foam gasket

2.9 PERFORATED DIFFUSERS

A. Perforated grilles shall have blades located in the neck of the unit.

B. Blades shall have adjustable 2, 3, or 4-way ceiling pattern, with high anti-smudge characteristics and center aspiration.

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

SECTION 23 37 14 - 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 dust collector manufacturers are acceptable:
   a. Provent
   b. Torit-Day
   c. Car-Mon
   d. Approved Equal

PART 2 - PRODUCTS

2.1 DUST COLLECTOR (CYCLONE TYPE)

A. General:

1. Dust collector shall be cyclone type constructed of 16-gauge steel.
2. Efficiency shall be 99% for steel grindings and sawdust and 94% for baking flour by weight.

B. Fan:

1. Motor shall be end mounted and shall be adjustable at 45-degree intervals.
2. Motor shall be rated for industrial duty.

C. Inlet:

1. Inlet shall be adjustable at 90-degree intervals.

D. Accessories:

1. Support stand
2. 55 Gallon collection drum
3. Weatherproof cover

E. Duct System:

1. Duct shall be welded steel. Prime and paint.
2. Flexible hose shall be:
   a. Torit flexible metal hose
3. Dust collection fitting shall be custom designed for each piece of equipment and shall be similar in construction to:
   a. Torit Dust Nozzle. Attach fitting to each piece of equipment.
4. Cutouts shall be:
   a. Torit
   b. Car-Mon BG

F. Submittals:

1. Include duct and equipment layout, fittings and accessories, and attachment detail to equipment.

2.2 SOURCE CAPTIVE (POINT OF USE) EXHAUST SYSTEM (TYPE 1 - GENERAL PURPOSE)

A. General:

1. System provided shall be suitable for corrosive fume and dust collection. System shall include flexible hose and support, fan (where specified or scheduled), hood, and mounting supports.
2. System shall be capable of 360-degree rotation.

B. Hose and Support:

1. Arms, hoods, and accessories shall be 304L stainless steel.
2. Ceiling support frame where exposed shall be 304L stainless steel. Frames shall be suitable for welding to field installed support angles.
3. Positioning system shall utilize any of the following:
   a. Gas cylinder and tension discs

b. Spring loaded, ball bearing friction joint

4. Hose shall be constructed of a neoprene coated fiberglass cover, corrosion resistant spring steel helix neoprene coated fiberglass cord and a liner of coated fiberglass fabric.
5. Hose shall meet UL 94V-0 flame rating and be suitable for -65 degrees F. to 250 degrees F. (continuous).

C. Fan:

1. Fan shall be suitable for installation in ceiling position.
2. Entire fan assembly shall have an epoxy coating. See special Coating specifications.

D. Accessories:

1. Provide 304L stainless steel fume receptor with (18" x 24" inlet).

E. Source Captive shall be:

1. Ammerman PosiLock Flex-O-Way
2. Carmon Series EX

PART 3 - EXECUTION

3.1 SOURCE CAPTIVE (POINT OF USE) EXHAUST SYSTEM:

A. Coordination:

1. Contractor shall prepare shop drawings indicating exact hose drop location and maximum hose radius at 2 feet above floor and 4 feet above floor.
2. Contractor shall adjust location, if indicated, on reviewed shop drawings.

B. Install:

1. Provide support frame system to support system as high as practical in areas without ceilings.
2. Provide support frame system to support system at ceiling line or as indicated on plans or details in areas with ceilings.
3. Attach support frame system to structure for a rigid installation.

END OF SECTION

SECTION 23 41 00 - 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.

2.2 TWO INCH (2") PLEATED PANEL FILTERS

A. MERV 13A 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 0.41 inches WG at 500 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.

2.3 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

2.4 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 13A.

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.

END OF SECTION

SECTION 23 90 05 - 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 23 0502 - 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 Electrical 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 single zone VAV packaged heating and cooling unit manufacturers (with hot gas reheat) are acceptable:
   a. Trane
   b. Daikin
   c. JCI
   d. AAON
   e. Valent
   f. Addison

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. See equipment schedule.
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.
4. Hinged access doors with quick release handles shall be provided as follows:
   a. On all access sections on units 3 tons and larger.
   b. On filter sections for all units smaller than 3 tons.
5. Single wall cabinets shall be thermally and acoustically insulated with a minimum of R4 fiber insulation. Provide a foil, sprayed neoprene, or mat faced finish.
6. Dual wall cabinets shall be finished with a baked acrylic finish.

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. 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.

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. Indoor fan shall be direct drive plenum fan with ECM motor and speed adjustment feature or inverter duty motor with a variable frequency drive.
2. Fan shall be seismically isolated.
3. The fan shall be mounted on spring isolators with a minimum 1" deflection.

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.
4. Drain pan float switch.

K. Electrical (Outdoor Unit):

1. Provide control voltage transformer.
2. Provide an unswitched GFI service receptacle on all three phase outdoor units. Receptacles shall have metal covers.
3. Provide transformer for motor or heaters as required.
4. Transformers shall be factory mounted and wired.
5. Power to the packaged unit shall be through the interior of the unit curb.

L. Electric Heaters:

1. Heaters shall have a total output as scheduled on drawings.
2. Each heater assembly shall include power supply fusing if over 48 amps, automatic resetting limit switches and heat limiters for thermal protection.
3. Heaters shall be provided with polarized plug for quick connection to unit low voltage wiring.
4. Electric heaters factory furnished and installed capacity not to exceed scheduled capacity at rated voltage.
5. If larger heaters are supplied, they shall not be large enough to require larger supply wiring or disconnects.
6. Heaters shall have SCR control except where staged heaters are scheduled.

M. Refrigerant Circuit (Units with Hot Gas Reheat):

1. Provide full modulating control of hot gas reheat.
2. Reheat control shall maintain space setpoint to ± 2 degrees F.
3. Discharge air temperature shall be adjustable from the building automation control system.

N. Energy Recovery (Units with Heat Wheels):

1. Heat wheel shall be installed in a rigid frame with wheel motor drive, drive belt, wheel seals and bearing.
2. Energy recovery option shall include exhaust fan with adjustable belt drive, backdraft damper and 2" throwaway filters.
3. Wheel shall be constructed of a lightweight polymer with permanently bonded desiccant coating, wheel shall be total energy wheel.

O. Drain Pan:

1. Provide dual slope insulated noncorrosive drain pan.

P. Filters:

1. Provide flat filter rack for 2-inch pre filter.

2. Where additional filters are specified, additional filter racks shall be provided for the additional filters.

Q. Outside Air Intake:

1. Provide outside air intake hoods with birdscreen when outside is specified directly from outdoors.
2. Settable low leak, motorized, outside air dampers.
3. See Instrumentation and Control for HVAC specification for airflow measuring requirements.

R. Provide BACnet communication card on all equipment.

S. Controls:

1. The unit shall be provided with digital controls to provide the specified sequence of operation. See the Sequence of Operations specification.
2. Space temperature and humidity sensors shall be capable of controlling the unit in cooling, heating, and dehumidification modes.
3. The space sensor shall have an override button.
4. The unit controller shall have a built-in schedule maintained in non-volatile memory. As a minimum, the schedule shall include:
   a. 16 holidays up to 5 days each.
   b. One start/stop per day.

5. The unit controller shall provide as a minimum:
   a. Space cooling setpoint
   b. Space heating setpoint
   c. Space humidity setpoint
   d. Supply air reheat setpoint

2.2 PACKAGED OUTSIDE AIR DEHUMIDIFICATION UNITS

A. Unit:

1. Unit shall be dual wall construction.

B. Compressors:

1. Units over 7-1/2 tons shall have a minimum of 2 compressors.
2. At least one compressor in each unit shall be a variable speed compressor.

C. Hot Gas Reheat:

1. Hot gas reheat coil with full modulation.

D. Units with Recirculation Mode:

1. Units shall have a recirculation damper that allows the unit to operate in 100% recirculation mode (i.e., zero outside air).

E. Controls:

1. Controls shall be factory mounted to provide the sequence of operation required.

2. Fan airflow measuring station.

F. Electrical:

1. Factory mounted circuit breaker.

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. Compressors shall have five (5) year parts and labor warranty:

B. Compressor Failure:

1. When a compressor fails within the warranty period, the compressor shall be replaced.
2. 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

SECTION 26 05 00 - 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 systems
4. Conductors and cables
5. Lighting and lighting controls
6. Electrical work associated with Fire alarm system.

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 completely 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-2020)
2. South Carolina Building Code (SCBC 2021)

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. Products included in the specifications and drawings indicate a basis-of-design. Where less than (3) manufacturers are indicated for a product, equal substitutions will be considered provided that adequate information is provided to demonstrate compliance with the design intent of the specifications and drawings.

B. Submittals shall be concise and clear. Submittals which include manufacturer's catalog data on other products or non-applicable options do not satisfy this requirement.

C. Submittals shall be accompanied by samples, descriptive literature and engineering information, as necessary, to fully identify and appraise the product.

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 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.

E. 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.

F. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required.

G. Approval of the equipment does not relieve the contractor of the responsibility of furnishing and installing the equipment at no additional cost.

H. Where Contractor substitutes equipment manufactured by an alternative vendor, 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 (NOT USED)

END OF SECTION

SECTION 26 05 01 - 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 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 electrical equipment as specified in subsequent sections.

C. All 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 the 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 record set drawings.

B. At the time of final inspection, two corrected sets of drawings shall be delivered to the Architect. Drawings 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 the 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 the 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 are herein specified, are exceptions.

1. Nameplates shall be attached with screws or rivets.

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 WORK PERFORMANCE

A. Arrange, phase and perform work to assure uninterrupted electrical service for other buildings. 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 UL listed firestop assembly that matches the rating and is intended for the penetrated construction to provide an effective barrier against the spread of fire, smoke and gases. Penetrations shall be made, and the fire-stopping installed in accordance with manufacturers written instructions and UL details.

3.5 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 them 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.

3.6 DISPOSITION OF EXISTING MATERIAL AND EQUIPMENT

A. 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 other materials or debris resulting from demolition operations from the site.

3.7 EXCAVATING, TRENCHING, BACKFILLING AND RESURFACING

A. Perform work as required, indicated, and in compliance with site work. Excavation depths indicated are below finished grade.

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.

D. Repair the excavated area to original pre-excavation condition. Repair and replace sidewalks, roadways, etc.

3.8 IDENTIFICATION

A. Upper case letters of uniform height; centered on device, cover plate, 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 inside covers in exterior locations and outside covers in unfinished areas of the following with a permanent ink marking pen:

1. Junction boxes or portions of junction boxes with 277- or 480-volt wiring.
2. Communications system pull and junction boxes.
3. Pull, junction boxes, and raceway installed above ceilings and for future use.

D. Label feeder conductors and branch circuit 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.

3.9 ACCESS TO EQUIPMENT

A. All equipment shall be installed in location and manner that will allow for convenient access for maintenance and inspection.

3.10 CONNECTION OF EQUIPMENT FURNISHED AND INSTALLED UNDER OTHER DIVISIONS OF THE WORK

A. This Contractor shall rough-in and make final electrical connection to equipment requiring electrical connections with such equipment being furnished and installed under other Divisions of the Work.

B. Installations shall be functional and code complying.

C. 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.

D. Connection of Kitchen/Food Service Equipment shall be as follows:

1. Furnish and install conduit and wiring for Food Service Equipment, including junction boxes and receptacles at walls.
2. Coordinate with equipment supplier for specific types of receptacles required for plug-in equipment. Receptacles shown on electrical plans are symbolic only and are not intended to indicate exact types of connection.
3. Furnish and install disconnect switches between rough-in points and final connection points on equipment.

E. Connection of elevator equipment shall be as follows:

1. Rough-ins and connections vary between elevator manufacturers. Rough-ins shown on electrical plans are symbolic and do not represent rough-ins specific to each elevator manufacturer specified for use within the contract documents. Coordinate necessary rough ins with elevator equipment supplier/installer. See architectural specifications for elevator manufacturers, coordinate rough ins with elevator equipment provider.
2. Furnish and install rough-ins, conduit and conductors for elevator power, controls and maintenance in accordance with the NEC and elevator manufacturer’s specific requirements.

3. Furnish and install additional lighting required to meet manufacturer's shaft lighting requirements.
4. Furnish and install disconnect switches, fused and non-fused, with necessary interface contacts between rough-in points and final connection points on equipment.
5. Furnish and install conduit, conductors, contactors, relays, shunt trip breakers, and miscellaneous equipment required to perform the following functions associated with elevator operation:
    a. Connection to automatic transfer switch(es) pre-transfer interfaces.
    b. Shunt trip circuit breakers where required.
    c. Interface with building fire alarm and communications systems.
    d. Rough-in and connection of sump pumps, oil separators, oil detection systems and other systems necessary for elevator operation furnished by other trades of work.

3.11 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. After corrections have been made the Contractors shall notify the Architect/Engineer who will recheck the systems for compliance of items listed.

3.12 COORDINATION WITH COMMISSIONING AGENT

A. Contractor shall coordinate their work with the Owner's Commissioning Agent. Provide necessary labor, materials, test equipment, etc. Attend meetings with the Commissioning Agent and participate in the development and implementation of the Commissioning Plan.

B. Perform necessary corrective work to comply with deficiencies noted by the Commissioning Agent.

3.13 CLEANING

A. Periodically 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

SECTION 26 05 03 - 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

SECTION 26 05 19 - 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. THHN - THWN – Dry, Damp, Wet Locations
   b. XHHW – Dry, Damp, Wet Locations.

4. Color Code:
   a. All secondary service, feeder, and branch circuit conductors shall be color coded as follows:

208/120 Volt	Phase	480/277 Volt
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray

   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. 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 flaming 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 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.

END OF SECTION

SECTION 26 05 26 - 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 or all 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 copper clad 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 all 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 all 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. Where ground connections will be permanently concealed, make the connections by the exothermic process to form solid metal joints. Make accessible ground connections with clamp type ground connectors.

D. Where rock prevents the driving of vertical ground rods, installing 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 all ground resistance tests and corrective actions and include copies within the Operation and Maintenance Manual.

END OF SECTION

SECTION 26 05 33 - 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. Liquid tight 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.

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. Exposed or concealed - RMC or IMC
   b. Below slabs on grade or underground outside of building - PVC

2. Feeders to motors: Same requirements as power distribution feeders.
3. 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

4. HVAC equipment feeders 1-1/2" trade size and larger: Same requirements as power distribution feeders.
5. HVAC equipment feeders smaller than 1-1/2” trade size: Same requirements as branch circuits from panelboards.
6. Low voltage systems such as building automation and control systems, information technology systems: 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 than 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.
4. Seal conduits at building entrances and outdoor terminations for equipment with a suitable compound to prevent the entrance of moisture and gases.

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. Chain, wire, or perforated strap shall not be used to support or fasten conduit.

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. Conduits shall be factory painted.

B. Color Code for conduits shall be as follows:

1. Power distribution – no color
2. Fire alarm systems – red.
3. Information technology systems – blue
4. Intercom, paging, and public address systems - blue
5. CCTV, security – orange
6. Lighting control – blue
7. Building automation and control - green

END OF SECTION

SECTION 26 05 35 - 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 indicted, 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

SECTION 26 05 48 - 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 2021

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 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 ANCHOR BOLTS AND NUTS FOR PAD-MOUNTED EQUIPMENT

A. Pad-mounted equipment shall be anchored with a minimum of four (4) bolts. Each bolt shall be a 6" in length or at least 10 times longer than the nominal diameter of the bolt with a 90-degree hook on the non-threaded end.

B. Nuts shall be heavy duty hexagon nuts.

C. Minimum bolt sizes are as follows:

1. Equipment up to 500 pounds, 3/8" diameter.
2. Equipment from 500 to 1000 pounds, 1/2" diameter.
3. Equipment from 1000 to 5000 pounds, 5/8" diameter.
4. Equipment from 5000 to 10000 pounds, 3/4" diameter.

2.4 ELECTRICAL EQUIPMENT

A. Systems include but are not limited to the following:

1. Electrical switchgear
2. Electrical conduit 2-1/2" inside trade diameter or greater
3. Panelboards
4. Dry Type Transformers
5. Emergency Lighting Systems
6. 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.
7. Fire Alarm Systems

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 support shall be attached to roof structure.

2.5 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

SECTION 26 09 23 – AUTOMATIC LIGHTING CONTROL

PART 1 - GENERAL:

1.1 SCOPE OF WORK

A. Furnish, install, and connect all conduit, fittings, boxes, controls, control wiring, and all other devices, whether specified/indicated or not, to produce a complete and functional automatic lighting control system.

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 of the building construction documents.
2. All other Division 26 sections.
3. All Division 27 and 28 sections.

1.3 SUBMITTALS

A. Submit catalog cuts and descriptive literature for approval in accordance with Section 26 05 00 - Electrical General Requirements.

B. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

C. Manufacturer shall substantiate conformance to this specification by supplying the necessary documents, performance data, and wiring diagrams. Any deviations to this specification must be clearly stated by letter and submitted.

D. Submit scaled lighting plans clearly marked by manufacturer showing proper product, location, and orientation of each sensor. Scale shall match that used in the Contract Documents.

E. Submit manufacturers cut sheets, including sensor performance information indicating compliance to the specification.

1.4 AS BUILT DRAWINGS

A. Section 26 05 00 - Electrical General Requirements shall apply.

1.5 RESPONSIBILITY

A. All equipment to be the responsibility of the single lighting control manufacturer.

B. All variations from the specified equipment must be approved by the Architect, Owner and Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Watt Stopper, Inc. (basis of design) or preapproved Equal. For preapproval, provide all of the information required for review a minimum of ten (10) working days prior to the initial bid date.

B. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure that any price quotations received and submittals made are for sensors which meet or exceed the specifications included herein.

2.2 PRODUCTS

A. All products numbers listed are those Watt Stopper. See plans for part numbers and device descriptions. Provide latest version of devices superseding part numbers shown on plans.

B. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet, and half-step motion up to 1,000 square feet.

C. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277 volts and shall have 180-degree coverage capability.

D. Bi-level wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1,000 watts at 277 volts.

E. Passive Infrared and Dual Technology sensors shall have fully automatic operation.

F. All sensors shall be capable of operating normally with electronic ballast, PL lamp systems, and rated motor loads.

G. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

H. All sensors shall have tool-less accessible, user adjustable controls for time delay and sensitivity. Controls shall be concealed to limit tampering.

I. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.

J. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005% tolerance to assure reliable performance and eliminate sensor crosstalk. Sensors using multiple frequencies are not acceptable."

K. All sensors shall provide a method of indication to verify that motion is being detected during testing and that the unit is working.

L. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging, and other control options. Sensors utilizing separate components to achieve this function are not acceptable.

M. All sensors shall have no leakage current to load in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.

N. All sensors shall have UL rated, plastic enclosures.

O. Wall switches shall be provided with oversized stainless steel device plates.

2.3 LOW VOLTAGE CONTROLLED RELAY PANELS

A. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:

1. Removable, plug-in terminal blocks with screwless connections for all low voltage terminations.
2. Individual terminal block, override pushbutton, and LED status light for each relay.
3. Direct wired switch inputs associated with each relay and group channel shall support two-wire, momentary or maintained contact switches.
4. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches, digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs, digital IO modules capable of receiving momentary or maintained contact closure inputs, digital photocell modules, and digital occupancy sensors.
5. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.
6. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
7. Group, channel, and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any group of relays can be associated with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override pushbuttons and LED displays for channels 1-9 or a handheld IR programmer for channels 1-99.
8. Relay group status for each channel shall be provided through red LED indicators for groups 1-9 and via BACnet for groups 1-99. Solid red indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.
9. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.

B. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.

C. Lighting control panels shall be WattStopper model LMCP8, LMCP24 or LMCP48 as shown on the plans.

D. Relay panels shall provide functionality as described on plans; however, there shall be a minimum of 8 global control channels for each separate system. See low voltage-controlled relay panel riser diagrams and lighting control schedules for description of system control requirements.

E. Relay panels shall be provided with number of relays required to accomplish lighting control indicated on plans plus an additional 30% for future use. Each homerun noted to be controlled by a relay panel shall be provided with a dedicated relay for control.

F. Provide photocontrol package where exterior lighting is to have photocell control.

G. Relays for lighting control shall be mechanically latched and shall maintain state upon loss of power. Electrically held relays for lighting control are not acceptable.

H. User Interface:

1. Each lighting control panel system shall be supplied with at least (1) handheld IR remote programming interface consisting of a keypad and associated OLED display screen. The user interface shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following functions as a minimum:
2. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
3. Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.
4. Program up to 254 separate scheduled events. Events shall occur on seven-day intervals with each day selectable as active or inactive and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.
5. Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven-day intervals with each day selectable as active or inactive and shall be configurable as to whether the event is active on holidays.
6. Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.
7. Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.

8. An additional handheld IR remote shall be provided and permanently mounted to the panel interior via a retractable anti-theft lanyard to allow for convenient programming of the panel while assuring that the handheld programmer is always present at that panel. An unlimited number of handheld IR remotes may also be purchased for facilities staff as seen fit by the end user's representative

2.4 CIRCUIT CONTROL HARDWARE

A. For ease of mounting, installation and future service, control unit(s) shall be able to mount within J boxes and be an integrated self-contained unit consisting internally of load switching control relay and a transformer to provide low voltage power to a minimum of three (3) sensors.

1. Relay Contacts shall have ratings of:

   13A 120 VAC Tungsten

   20A 120 VAC Ballast

   20A 277 VAC Ballast

2.5 CONTROL WIRING

A. Control wiring between sensors and controls units shall be Class II, 1824 AWG stranded U.L. Classified, PVC insulated, or Teflon jacketed cable approved for use in plenums, where applicable.

B. Control wiring shall be installed in conduit, size as required for cabling.

PART 3 - EXECUTION

3.1 GENERAL

A. It shall be the contractor's responsibility with the manufacturer's assistance to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas. The contractor shall arrange a pre-installation meeting with a factory authorized manufacturer representative to verify placement of sensors to insure proper system operation.

B. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within in the room(s).

C. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.

D. Proper judgment shall be exercised by the contractor in executing the installation, taking into consideration the device installation and to overcome local difficulties due to space limitations or interference with system performance due to building structural, finish and HVAC components.

E. The contractor shall obtain factory assistance and guidance in the initial sensor sensitivity adjustments and aiming of the sensors to provide specified system performance.

3.2 TESTING AND START-UP

A. Upon completion of installation and initial adjustments the Contractor shall notify the manufacturer who shall provide a factory trained engineer to check, program and test the equipment and make adjustments as necessary to comply with the performance requirements specified within.

3.3 OWNER TRAINING

A. Provide eight (8) hours of training for an Owner representative scheduled at the convenience of the Owner.

1. Person conducting the training shall be a factory authorized representative knowledgeable in the systems specified within.
2. The Contractor shall contact Owner and schedule training with Owner.

3.4 GUARANTEE

A. Guarantee shall be total and complete and shall be for one (1) year starting with the date of total project acceptance.

END OF SECTION

SECTION 26 24 16 – 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. Surge protective devices (SPD) shall comply with:

1. Latest editions of UL 1449 and 96A.
2. IEEE standards C62.45-2002, C62.41.1, C62.41.2
3. NEMA LS1
4. NEC Article 241
5. NFPA 780

H. 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 for branch circuit and distribution panelboards. 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":

Siemens (basis of design)	P1
ABB (General Electric)	AQ
Eaton	PRL1a

2. Branch Circuit Panelboards (277/480 V Operation). Minimum cabinet width shall be 20":

Siemens (basis of design)	P2/P3
ABB (General Electric)	AD
Eaton	PRL3

3. Distribution Panelboards:

Siemens (basis of design)	P4/P5
ABB (General Electric)	ReliaGear neXT
Eaton	PRL4

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.

2.3 SURGE PROTECTIVE DEVICES (SPD):

A. Unless otherwise noted SPD shall be integral and factory installed within panelboards. SPD shall be a standard product of the panelboard manufacturer.

B. SPD shall be parallel protective devices utilizing Metal Oxide Varistors (MOVs) for the primary suppression components. MOVs shall be furnished with UL recognized surge rated fuses rated 200kAIR for protection and shall incorporate a thermal cutout device.

1. Type 1 SPD connected ahead of the service disconnect shall be furnished as an assembly with a factory disconnect switch to facilitate replacement of SPD components.

C. SPD shall be provided with:

1. Active indicator lamps which extinguish or change color when protection has failed.
2. Form C dry contact for auxiliary alarm monitoring.
3. Audible alarm with silence switch.

D. SPD shall safely reach an end-of-live condition when subjected to fault current levels between 0 and 200kA.

E. SPD shall be covered by a 10 year unconditional warranty.

F. SPD shall:

1. Be Type 1 or Type 2 SPD.
2. Provide L-L, L-N, L-G and N-G modes of protection for 1 phase 3 wire and 3 phase 4 wire systems. L-L and L-G modes of protection shall be provided for 1 phase 2 wire and 3 phase delta systems.
3. Nominal discharge current (In) shall be 20kA.
4. Maximum VPR shall be as follows:
   a. 480/277V: 2000V L-L, 1200V L-N, 1200V L-G, 1200V N-G
   b. 208/120V: 1200V L-L, 700V L-N, 700V L-G, 700V N-G
   c. 240/120V: 1200V L-L, 700V L-N, 800V L-G, 700V N-G
5. Single pulse surge current capacity shall be as follows:
   a. PL1 – 400,000 per phase
   b. PL2 – 160,000 per phase
   c. PL3 – 80,000 per phase (branch circuit panelboards)
   d. PL3 – 40,000 per phase (Fused coordination panelboards)

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.

M. Adjust current setting of solid state trip units to match scheduled overcurrent ratings.

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

SECTION 26 25 13 – PLUG-IN BUSWAYS

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. This section includes the furnishing and installation, at locations shown on the drawings, of approved plug-in busways of types 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. Other Division 26000 sections

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain busways, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for busways including clearances between busways 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. Busways and busway installations shall comply and with the following standards:

1. NEMA standards BU 1.1 and KS 1.
2. NFPA 70 (NEC).
3. UL 857.
4. NECA standards #1 and #408.

1.4 SUBMITTALS

A. Submit catalog cuts and descriptive literature for approval in accordance with Section 260501 - Electrical Coordination.

B. Submit dimensioned plan views and sections, include details for proposed supports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Environmental Limitations:

1. Do not deliver or install busways 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.

1.6 COORDINATION

A. Coordinate layout and installation of busway and components with other construction, 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Busways, associated components and accessories, shall be Square D I-Line plug-in busway (Basis of design) or equal products by one of the following manufactures:

1. ABB
2. Siemens
3. Eaton

2.2 PLUG-IN BUSWAY

A. Provide 100% rated, totally enclosed, nonventilated, plug-in busway suitable for voltage system, ampacity and SCCR as indicated on plans.

B. Busway construction shall utilize silver-plated copper conductor bars. Housing shall be powder coated in manufacturer's standard color.

C. Plug-in openings shall be on 2’ centers and shall utilized permanently attached hinged door covers to protect unused plug-in openings.

D. Busway shall incorporate an aluminum, 50% busway capacity, equipment grounding conductor that is integral to the construction of the busway housing.

E. Furnish busways complete with fittings, tap boxes/power feeds, elbows, and end closures to form a complete plug-in busway system.

2.3 CABLE TAP BOXES

A. Provide busways with cable tap boxes as noted on plans.

2.4 BUS PLUG-IN UNITS FOR FEEDER AND BRANCH CIRCUITS

A. Bus plugs-ins shall be 3 phase units with ampacities and overcurrent protection type and rating shown on plans.

B. Provide bus plug-ins for 4 wire busways with neutral connections.

C. Plug-in units shall be interlocked to prevent installation or removal of the unit while in the on position.

2.5 SUPPORTS AND BRACING

A. Hangers and bracing hardware utilized for attachment of supports to busway shall be the standard products of the busway manufacturer.

B. Provide sway braces for busways that have bus plug-in units installed on only one side of straight runs.

2.6 ACCESSORIES

A. Provide 8ft hookstick for each run of busway.

PART 3 - EXECUTION

3.1 INSTALLATION OF BUSWAYS

A. General: Install busways in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA standards, and in compliance with recognized industry practices.

B. Coordinate installation with cable and raceway installation work.

C. Support from structure above with spacing between supports not to exceed 5 feet unless otherwise designed and marked by manufacturer to permit longer support spacing intervals. Utilize minimum ½” diameter all-thread rod with busway hangers obtained from busway manufacturer.

D. Seismic bracing shall be provided in accordance with section 26 0548 - Seismic Support of Electrical Equipment.

E. 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.

F. Provide properly wired electrical connections within enclosures.

G. Provide engraved plastic identification label black face with white lettering on cable tap box, indicating equipment name, voltage system, and upstream distribution including room name and number. Attach identification labels with rivets or sheet metal screws.

H. Provide equipment grounding connections, tighten connections to comply with tightening torques specified in UL Stds. 486A to assure permanent and effective grounds.

3.2 FEEDER AND BRANCH CIRCUIT CONNECTIONS

A. Connections from raceways to plug-in units shall be made utilizing flexible metal conduit in lengths no longer than 6’.

B. Connection and support of flexible cords to plug-in units shall be in accordance with NEC Article 368.

3.3 FIELD QUALITY CONTROL

A. Prior to energization of circuitry:

1. Check accessible connections are tightened to manufacturer's torque specifications.
2. Check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
3. Check for electrical continuity of circuits, and for short circuits.

B. Subsequent to wire and cable hook-ups, energize and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units and then retest to demonstrate compliance.

END OF SECTION

SECTION 26 27 26 - 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 05 00 - 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. Unless noted otherwise device color shall be ivory. Wiring devices shall comply with NEMA publications WD1 and WD6.

B. Receptacles shall comply with Federal Spec WC-596.

C. Toggle switches shall comply with Federal Spec WS-896.

D. 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

E. Wiring devices shall be as listed in the following table, or approved equal:

Description	Legrand	Hubbell	Leviton
Single Pole Toggle Switch	PT20ACI	SNAP1221	M1221-I
Three Way Toggle Switch	PT20AC3I	SNAP1223	M1223-I
20A 125V 2P 3W Grounded Duplex Tamper Resistant Receptacle (NEMA 5-20R)	PTTR5362I	SNAP5362ITR	M5362-I
20A 125V 2P 3W Grounded Duplex Tamper Resistant Ground Fault Interrupter (NEMA 5-20R)	PT2097TRI	GFTWRST20SNAPI	MGFT2-I
20A 125V 2p 3W Grounded USB (2) Type AC USB Ports w/Duplex Tamper Resistant Receptacle (NEMA 5-20R)	TR5362USBI	USB20A5I	T5832-I

Description	Legrand	Hubbell	Leviton
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
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 a weather resistant duplex GFCI receptacles similar to those under 262726 WIRING DEVICES, Part 2.1.C, 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.

B. Type “WP” - Wet Locations: Weatherproof receptacles shall be a weather resistant duplex GFCI receptacles as specified under 262726 WIRING DEVICES, Part 2.1.C, 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.

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

SECTION 26 28 16 - 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 QUALITY ASSURANCE

A. Safety/Disconnect switches shall conform to Underwriter's Laboratories UL 98, "Enclosed and Dead-Front Switches."

1.3 SUBMITTALS

A. Submit catalog cuts and descriptive literature for approval in accordance with Section 26 05 00 - Electrical General Requirements.

PART 2 - PRODUCTS

2.1 GENERAL SAFETY/DISCONNECT SWITCH FEATURES

A. Switches shall be NEMA type HD (Heavy Duty) and UL listed.

B. 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.

C. 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".

D. 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.

E. 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.

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. Eaton
4. Siemens

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

SECTION 26 51 00 - 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 and labeled.

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 26 05 00 - 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. Support fixtures securely from building structure. Grid ceiling framing members shall not be used to support fixtures.

3.2 CLEAN-UP AND RE-LAMPING

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.

C. Review and ensure that all lamps installed are exactly as specified for each fixture type.

D. Replace all burned out or inoperative lamps and inoperative ballasts in all fixtures so that all lighting fixtures will be in first class operating condition upon acceptance.

END OF SECTION

SECTION 28 31 11 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations required to extend the existing Simplex 4010 Fire Alarm System serving the building to the renovation areas as shown on the drawings and as specified herein.

B. The Fire Alarm System shall provide fire protection and warning to the building as presently configured.

C. All equipment, devices and wiring required to form a complete code-compliant fire alarm system and comply with the requirements of this specification shall be included.

D. For each new 24VDC power supply provided, provide a new dedicated 20A, 120V **circuit (not shown on drawings)** sized 2#12, #12Gnd., ¾"C. from the nearest existing 120/208V branch circuit panelboard.

1.2 RELATED WORK/SECTIONS

A. In addition to this section, the requirements of the conditions of the Contract, Supplementary Conditions and General Requirements, apply to the work specified in this section.

B. The work covered by this section of the specifications is to be coordinated with the related work as specified elsewhere under the project specifications.

1.3 QUALITY ASSURANCE

A. The complete installation is to conform to the applicable sections of the International Building Code (IBC), NFPA-72, Local Code Requirements, and the National Electric Code, with particular attention to Article 760.

B. UL Compliance and Labeling: Provide components which are UL listed and labeled in accordance with the following UL Standards:

1. UL 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems
2. UL 864 (9th edition) - Standard for Control Units and Accessories for Fire Alarm.
3. UL 1481 - Standard for Power Supplies for Fire-Protective Signaling
4. UL 1971 – Standard for Signaling Devices for the Hearing Impaired
5. UL 2572 - Standard for Control and Communication Units for Mass Notification Systems.
6. Other UL listings: Each device, component and sub-component of the fire alarm system shall be listed for its intended function.

C. NEMA Compliance: Comply with applicable portions of NEMA Std. Pub. SB 4 pertaining to installation of fire alarm systems.

D. The system is not required to be U.L. certificated. However, the following items shall be included in the bid:

1. System installation, checkout/testing, and system demonstration for the Owner, Engineer, and Authority Having Jurisdiction per NFPA-72 requirements and per the Construction Drawings and Specifications.
2. Central Station monitoring service is existing and is provided by the Owner's existing Central Station monitoring company (obtain monitoring company phone number and account numbers from the Owner).
3. **Installation and testing of all fire alarm system devices, equipment, and wiring** shall **be performed by a qualified electronics contractor licensed specifically for signal systems installation and that is an authorized Simplex distributor.**
    a. All installers shall be factory trained representatives of the equipment manufacturer and shall be licensed and authorized to install the fire alarm system wiring and equipment approved for the installation.
    b. All installers shall have a minimum of two years of wire, equipment, and device installation experience *with the make/model of equipment being furnished*.
    c. The installation of the system wiring, equipment, and devices shall be supervised throughout the entire duration of the project by a factory trained Technician or Engineer employed by the manufacturer's representative with a minimum of five years of experience *in the installation of the make/model of equipment being furnished*. This person shall hold a current minimum NICET III Certification.
    d. All system programming shall be performed by a factory trained Technician employed by the manufacturer's representative with a minimum of two years of experience *in programming of the specified system.*

1.4 SUBMITTALS

A. Shop Drawings: As a minimum, the fire alarm and fire detection shop drawing submittal shall include all items relating to fire alarm system modifications:

1. Complete data sheets bearing the printed logo or trademark of the fire alarm control panel manufacturer for all equipment including but not limited to the following:
    a. System power supplies with battery backup and charger
    b. Standby batteries and battery charger
    c. Each separate type of automatic smoke and heat detector to be connected to the system
    d. Manual alarm initiating stations
    e. Visual alarm notification appliances
    f. Combination audible/visual notification appliances
    g. Control and monitoring modules
    h. Any other items of fire alarm equipment required by the drawings and/or specifications

2. Battery manufacturer date-codes keys.
3. Evidence of listing of all proposed equipment by Underwriter's Laboratories for application as fire alarm equipment.
4. Complete calculations showing the following:
    a. Battery calculations for all system power supplies and amplifiers.
    b. Voltage drop (visual notification appliance circuits)

5. Written certification by the contractor that no battery, power supply or circuit on the system has an electrical load greater than 80% of its actual capacity, when all items are taken into account.
6. Provide scaled floor plans, riser diagrams, factory wiring diagrams, field wiring diagrams indicating the wiring of all devices to include raceway size and routing, junction boxes, and conductor size, type and quantity in each raceway. Information to be included on layout plans shall include but shall not be limited to the following:
    a. Circuit tags on all circuit legs.
    b. Labeling of all initiation devices (to include signaling circuit designation and device address).
    c. Labeling of all notification appliances with specific device identifier label and notification circuit number.
    d. Connections to HVAC systems.
    e. Connections to fire protection systems.

7. Submit labeling scheme for typical alarm and supervisory points as they are to appear at the specified display points. Include all abbreviations for device types and operational areas.
8. Provide specifications of all cable types labeled with their intended application. This cable shall have been tested and approved by the fire alarm control panel manufacturer for use with the manufacturer's equipment.
9. The Contractor shall not purchase any materials or equipment prior to receipt of approved shop drawings.

1.5 AS BUILT DRAWINGS

A. See Specification 26 0501 - ELECTRICAL COORDINATION.

1.6 SYSTEM SOFTWARE

A. Provide all fire alarm system operational software to owner that will allow the owner to operate, maintain the systems and make changes, additions and deletions to system initiation devices. Format shall be on flash drive.

1.7 SYSTEM DESCRIPTION

A. The major system elements include but are not limited to the following items:

1. Existing control panel modifications (FACP)
2. Manual pull stations
3. Visual alarm notification appliances
4. Audible/visual notification appliances
5. Smoke detectors
6. Duct smoke detectors
7. Smoke detectors
8. Batteries and chargers at fire alarm control panels, and power extender panels.

B. Audible & visual occupant notification configuration :

1. The system shall be configured to automatically activate all notification appliances throughout all areas of the facility upon activation of any manual or automatic fire alarm initiation device.

C. The building's fire alarm system shall signal all system alarm, trouble and supervisory conditions to the remote monitoring station.

D. Power Extenders with battery backup and charger, locations as shown on plans. Provide additional units as required for power to all notification appliances.

E. Conduit routing and system wiring is not shown on the plans. It shall be the responsibility of the fire alarm installer to coordinate with the fire alarm manufacturer to determine the conduit requirements (size and routing) and wiring required for system operation.

F. Surge Protective Devices (SPD) shall be provided as recommended by the manufacturer for all copper cables (at each end - install at cable termination points.) that enter and leave the buildings and for all 120V circuits serving fire alarm panels.

G. The system shall be electrically supervised non-presignal type.

H. Operation of any manual or automatic device shall:

1. Activate the audible and visual indicators and event message display at the local fire alarm control panel (FACP) and the remote annunciator panel(s) indicating the status of the event, initiating device or zone.
2. Activate remote station alarm, supervisory and trouble reporting procedure through the digital communicator and telephone system.
3. Initiate the local emergency evacuation signal throughout the building.
4. The system may be "reset" to normal standby condition upon restoring the initiating device to "normal" and activating the "reset" switch on the FACP panel or the "reset" switch at the remote annunciator panel(s).

I. All trouble and supervisory events shall cause the audible trouble signal to sound at the system control panels and Remote annunciator panel(s). Trouble and supervisory events shall be silenced locally by a switch at the control panels or Remote Annunciator panel. Visual indication of all trouble and supervisory events shall be displayed as follows:

1. The common trouble lamp shall illuminate and the trouble/supervisory event shall be displayed alpha-numerically on the LCD display on the control panels and Remote annunciator panel(s). Visual indication of trouble events shall remain until the condition is corrected and the system is reset. Visual indication of supervisory events shall remain until the condition is corrected and the system is reset (latching applications) or until the supervisory condition is self-restored (non-latching application). Trouble/supervisory events include but are not limited to the following:
   a. Ground, fault, or open on a signaling, 24VDC power circuit, or notification circuit.
   b. Failure of a system component or device.
   c. Loss of 120 volt operating power to control panel (see specifications on delay of remote reporting of this signal).
   d. Activation of any fire protection system supervisory point.

J. The main control panel (FACP) and Remote Annunciator panel (FAA) shall display system events via color touch screen liquid crystal display (LCD) screens. A consistent system of definitive and distinctive abbreviations shall be utilized to maintain a concise format of all

displays. Upon activation of a fire alarm initiation and/or supervisory device, the FACP panel and FAA shall display information as follows.

1. Device type (i.e. smoke detector, duct smoke detector, fire suppression system, manual pull station, etc.).
2. Air handler designation (if device is a duct smoke detector located at an air handler).
3. For fire protection system flow switches (where applicable), the display shall indicate the zone or area(s) served by that branch of the fire protection system.
4. For fire protection system tamper switches (where applicable), the display shall indicate the room name and room number where device is located.

K. All initiating devices shall be equipped with a local LED indicator to indicate alarm status of the device.

L. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.

M. Provide isolator modules as required by NFPA-72 to protect/isolate signaling circuit segments.

N. The system shall be configured for control of auxiliary equipment as follows:

1. Provide individual, remote addressable output modules with form "C" contacts for control of auxiliary equipment as noted on the plans.
2. Addressable output modules shall not reset until the system is manually reset.
3. All addressable output modules shall be configured for programmable activation by any initiation point or grouping of initiation points.
4. Provide heavy duty slave relays as required to accommodate the current and voltage requirements of the peripheral systems connected to the fire alarm system.

1.8 POWER REQUIREMENTS

A. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of twenty-four (24) hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure.

B. Provide battery chargers at all system panels as recommended by the system manufacturer. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel. All battery charging and recharging operations shall be automatic. The charging equipment shall be capable of recharging the batteries within 24 hours.

1. With exception of batteries for amplifiers, all batteries shall be sized with 20% minimum spare capacity. “Derating” factors do not qualify as spare capacity.

C. All circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.

D. Date marking of batteries:

1. All system batteries shall be permanently marked by the manufacturer with the month/year of manufacture using the month/year format.

a. Date-codes are not acceptable.

2. All system batteries shall be marked with machine generated stick-on labels by the contractor with the month/day/year of installation

1.9 COMMUNICATION WITH ADDRESSABLE DEVICES:

A. All addressable devices are to have the capability of being disabled or enabled individually.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide fire alarm system components and as manufactured by one of the following manufacturers (no equal):

1. Simplex

2.2 GENERAL:

A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. This shall include, but not be limited to, control panel modifications (hardware, firmware & software), manual pull stations, automatic fire detectors, horn/strobe units, strobe units, monitoring devices, control devices, all wiring, raceways, connections to devices, outlet boxes, junction boxes, and all other necessary material for a complete operating system.

B. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.

2.3 FIRE ALARM CONTROL PANELS (FACP): Existing to remain in service

A. Remote reporting (digital communicator): Existing to remain in service.

B. Existing Fire Alarm Control Panel (FACP) model is as follows

1. Simplex: 4010

2.4 FIRE ALARM POWER EXTENDER (FPE)

A. Fire alarm power extenders shall be by Simplex – no equal.

2.5 ALARM NOTIFICATION DEVICES

A. Alarm notification devices shall include:

1. Horn/strobes (combination audiovisual)

2. Strobes (visual only)

B. Audible/visual notification appliances shall meet the following requirements:

1. Wall appliance color: Red
2. Strobes:
   a. Synchronized flashing for all units within any viewing area. Strobe flash frequency shall be 1 fps.
   b. UL 1638 listed as a Visual Signaling Appliance for wall or ceiling mounted configuration as shown on the drawings.
   c. Multi-candela type with field selectable candela ratings as follows:
      1) 15 cd
      2) 30 cd
      3) 75 cd
      4) 95 cd
      5) 110 cd
      6) 135 cd
      7) 185 cd

   d. Minimum strobe candela settings shall be as noted on the drawings. Final settings shall be adjusted as required to ensure compliance with NFPA-72.
   e. Synchronized flashing for all strobe units within any viewing area (including strobes powered from different remote power supplies for which network synchronization modules shall be used). Strobe flash frequency shall be 1 fps.
   f. UL 1638 listed as a Visual Signaling Appliance for wall or ceiling mounted configuration as shown on the drawings.
   g. Device color shall match existing.

C. Notification appliances shall operate from the 24V DC polarized indicating circuits.

D. All visual notification appliances shall have meet the equivalent requirements of the Americans with Disabilities Act (ADA).

E. Flush devices shall mount on 4 x 4-inch or 2-gang electrical boxes. Box depth shall be coordinated with device supplier.

F. Outdoor devices exposed directly to weather shall be U.L. listed as weatherproof.

2.6 ADDRESSABLE DEVICE TYPES

A. General: The system control panels, over the two wire signaling channels, must be capable of communicating with the types of addressable devices specified below. All smoke detectors and heat detectors and the associated control panel hardware and software shall utilize the latest and most advanced intelligent detection technology available from the manufacture at the time of bidding.

B. Photo-electric Smoke Detectors:

1. Photo-optic sensing chamber, UL listed to Standard 268.
2. Low voltage, 2-wire solid state design incorporating tamper proof, plug-in head assembly.
3. Tamper-resistant design.

4. Intelligent addressable design with integral addressable transponder. Detector shall utilize fuzzy logic intelligence to continually analyze the ambient conditions present and shall signal the host control panel accordingly when ALARM or TROUBLE conditions are detected.
5. Separate detector mounting base: Molded construction equipped with terminal screws for all wiring connections, designed for mounting on any standard 4 inch square outlet box for concealed wiring, or special box for surface raceway.
6. Design to produce TROUBLE signal if detector head is removed from its mounting base and ALARM signal if detection chamber is removed.
7. LED that blinks when sensor is being polled and glows steady when in alarm.
8. Factory set device type code.

C. Addressable Pull Stations:

1. Pull stations shall be addressable. The stations shall be manufactured from high impact red Lexan or cast metal. Lettering shall be raised and painted white. Stations shall be single-action pull type requiring a firm downward pull to activate.
2. The station shall mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks.
3. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. The station shall consist of high impact Lexan, red in color.
4. The addressable manual station shall be capable of field programming of its "address" location on an addressable signaling line circuit.
5. There shall be no limit to the number of stations which may be activated or "in alarm" simultaneously.

2.7 CONTROL MODULES:

A. Addressable (field programmable).

B. Supervised.

C. Lexan coverplate.

D. Contacts shall be form "C", rated at 2A, 24 VDC and 0.5A, 120 VAC.

E. Where higher contact current ratings are required for the controlled device, provide heavy duty relays with proper Form "C" contact ratings slaved directly off of a control module through a supervised control circuit.

F. Provide supervised 24VDC circuits as required, powered from the local fire alarm control panel, for activating control modules and relays.

G. Coordinate contact voltage and current ratings with voltage and current ratings of controlled devices.

2.8 AUXILIARY RELAYS:

A. Specifications:

1. Electrically held.
2. 7A contact rating (@24Vdc & 120Vac).
3. 24Vdc coil, 15mA coil current (@24Vdc).
4. Form “C” contacts.
5. LED status indicator.

B. Model: PAM-SD (or approved equal)

2.9 MONITORING MODULES:

A. Addressable (field programmable).

B. Supervised.

C. Lexan coverplate.

D. Field assignable personality codes as follows:

1. Normally open alarm - Latching
2. Normally open alarm - Delayed latching
3. Normally open active - Non-latching
4. Normally open active - Latching

2.10 FIRE ALARM REMOTE ANNUNCIATOR PANELS (FAA): Existing to remain.

2.11 SYSTEM WIRING

A. General:

1. Survivability and pathway configurations:
   a. Unless otherwise specified herein, all circuits covered under this specification shall have a pathway survivability level of 0 (pathway defined by NFPA-72 as *“any circuit, conductor, optic fiber, radio carrier, or other means for transmitting system information to remain operational during fire conditions”*).

2. All cables installed underground or below building foundations shall be U.L. listed for exposure to wet locations (West Penn Aquaseal or approved equal).
3. All signaling circuit cables shall be provided as follows.
   a. NEC Type FPLP for all non-riser type cables (U.L. listed for fire alarm use).
   b. NEC FPLR (not a applicable to this project).
   c. Minimum size shall be #18AWG.

4. All floor-to-floor cables serving notification appliances, and 24VDC powered devices shall be provided as follows (manufacturer’s requirements shall take priority):
   a. NEC Type FPLR riser type cables, manufactured specifically for fire alarm system applications.
   b. Minimum size shall be #14AWG.

5. All horizontal circuits serving notification appliances, and 24VDC powered devices shall be provided as follows (manufacturer's requirements shall take priority):
   a. NEC Type FPLP, manufactured specifically for fire alarm system applications (non-riser type cables).
   b. 600V, THWN insulated wiring.
   c. Minimum size shall be #14AWG.

6. Separation shall be maintained for circuits utilizing copper conductors as required per NFPA 70, Article 760.

B. Initiation device signaling circuit pathways shall be Class B.

1. Floor-to-floor initiation device signaling circuit cable shall be FPLP type as classified by NEC Article 760.

C. Remote annunciator signaling circuit pathway shall be Class B.

1. Remote annunciator signaling circuit cable shall be FPLP type as classified by NEC Article 760.

D. Notification appliance circuit pathways shall be Class B.

E. All circuits shall be protected (power limited) as required per NFPA 70 to allow notification circuits to be installed in the same conduit as initiation and signaling circuits.

F. Fire Alarm circuits may be solid or stranded as recommended by the equipment manufacturer for each specific application.

2.12 GROUNDING OF LOW VOLTAGE SURGE SUPPRESSION DEVICES

A. Install a #12AWG THHN green insulated equipment grounding conductor in all fire alarm conduits serving low voltage surge suppressors. Connect the grounding conductor to each surge suppressor's grounding terminal and to the ground lug in the power supply or control panel enclosure serving the fire alarm devices connected to the associated fire alarm circuit(s).

2.13 BATTERIES

A. System batteries shall be sealed lead acid type listed for use with Fire Alarm systems.

B. All batteries furnished shall be new (unused) and shall be installed within one (1) year from the date of manufacturer.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. The Contractor is responsible for assuring that conduit size and wire quantity, size, and type is suitable for the equipment supplied. The Contractor shall review the proper installation of each type of device with the equipment supplier.

B. All wiring shall be installed in new conduit in unfinished spaces and above ceilings, and unless noted otherwise shall be installed in new wiremold where located below finished ceilings in finished spaces.

C. Furnish and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations.

D. All wiring shall be installed in strict compliance with all the provisions of NEC - Article 760, Part III - Power-Limited Fire Alarm (PLFA) Circuits, or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760, Part II Non-Power-Limited Fire Alarm (NPLFA) Circuits.

E. For ceiling device installations in suspended tile ceilings, adjustable T-bars & extra deep boxes shall be provided to accommodate specific ceiling types and to provide ample capacity and space for wiring pulling and circuit terminations.

F. The Contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

G. Make all fire alarm wiring continuous from control panel (or power extender panel) to device terminals.

H. T-taps are not allowed without approval (submit formal request for specific T-tap applications early in submittal phase and prior to submittal of layout drawings)

I. Protect detectors during construction period as required by NFPA-72.

J. Smoke detectors shall be mounted only in an orientation for which they have been listed.

1. Smoke detectors shall not be located any closer than 3'-0" from any ceiling type HVAC supply or return air grille and shall not be located anywhere within the direct path of any side-wall type HVAC supply air grilles. Separation shall be greater where higher air velocities dictate and smoke detection performance is likely to be impaired. All devices requiring relocation after installation that were not brought to the attention of the Engineer shall be relocated at the Contractor’s expense.

K. Final locations of all visual notification appliances and combination visual/audible notification appliances shall be adjusted as required up to 3’ maximum from the nearest obstruction (casework, smart board projectors, etc.) to provide unobstructed direct visibility of all visual appliances in the field of view. Review Architectural drawings (where applicable) prior to rough-in phase and report all discrepancies to the Engineer in writing. All devices requiring relocation after installation that were not brought to the attention of the Engineer shall be relocated at the Contractor’s expense

L. Installation and testing of all fire alarm system devices and equipment shall be performed by a qualified electronics contractor licensed specifically for signal systems installation. This Contractor shall be a factory trained representative of the equipment manufacturer and shall be licensed and authorized to install and maintain the fire alarm system approved for the installation.

3.2 CONTROL MODULES

A. Control modules shall be installed within 18 inches of their associated devices to be controlled and in a readily accessible location.

B. Verify locations of interface points with all systems in the field prior to conduit rough-in.

C. Provide control module interfaces for systems including but not limited to the following:

1. As noted on the drawings.

3.3 MONITORING MODULES

A. Monitoring modules shall be installed within 24 inches of their associated devices to be controlled and in a readily accessible location.

B. Verify locations of interface points with all systems in the field prior to conduit rough-in.

C. Provide monitoring module interfaces for systems as shown or as noted on the drawings.

D. The contractor shall be responsible for assigning the proper "personality code" for each monitoring module depending on the application.

3.4 PROGRAMMING

A. The system installer shall provide complete programming for all systems whether programming is factory installed or installed in the field by the system installer.

B. The system installer shall derive all user specified programming information (building designations, room descriptions, etc.) from the actual room names and numbers *not the construction drawings*.

C. All programming changes required by the Owner to render the system usable and functional by the Owner's standards shall be made at the contractor's expense.

3.5 LABELING

A. New power extender panels (FPE) shall be permanently labeled with their respective panel designations in accordance with general Division 26 labeling requirements.

B. Initiation devices and addressable monitoring and control modules shall be labeled with the SLC loop and address using machine generated stick-on labels.

3.6 120V BRANCH CIRCUIT BREAKER LOCK-OUT, MARKING, AND LABELING

A. All 120V branch circuit breaker handles serving fire alarm panels shall be provided with a “lock-out” type accessory per NFPA-72 requirements with a pad lock (keyed alike - furnish ten keys to the Owner) that allows the circuit breaker to be locked in the “ON” position and allow the circuit breaker to trip in an overload condition.

B. All 120V branch circuit breaker handles serving fire alarm panels shall be permanently marked with red color per NFPA-72 requirements.

C. The 120V panelboard index circuit designations for all 120V branch circuit panelboards serving fire alarm panels shall be identified typically FIRE ALARM CIRCUIT-FPE", etc. per NFPA-72 requirements.

3.7 TESTING, GUARANTEE, SERVICE

A. Provide initial certification testing of the system in accordance with the procedures outlined in NFPA 72. The minimum required tests for new equipment, devices, and circuits shall be as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits utilizing an insulation testing device.
3. Verify the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
4. Perform the following tests for all system batteries in strict accordance with NFPA-72:
   a. Charger test.
   b. Discharge test.
   c. Load voltage test.
5. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the period and in the manner specified.
6. Test each initiating and notification circuit. One connection each should be opened at not less than 10 percent of the initiating and notification devices.
7. Test each initiating and notification device for alarm operation and proper response at the control unit.
8. Test smoke detectors and carbon monoxide detectors with listed aerosols acceptable to the manufacturer or other such testing methods which are approved by the manufacturer.
9. Test heat detectors with U.L. listed heat generating test equipment.
10. Test the system for all specified functions in accordance with the manufacturer's operating and maintenance manual.
11. Verify that each alarm notification device functions as specified. Determine that the system is operable under trouble conditions as specified.
12. Field verification of auxiliary function interfaces:
    a. Field-verify and pretest each and every interface with auxiliary systems (air handler shut-down, elevator recall, kitchen hood suppression systems, etc.) at least three (3) weeks prior to acceptance testing.
    b. Submit a report to the Engineer at least seven (7) calendar days prior to scheduled acceptance testing with final confirmation of proper functioning of each auxiliary system. Each and every auxiliary system shall be listed in line item format with "PASS"/" FAIL" condition documented.
13. Provide all labor required for making one post-acceptance testing field adjustment to all audible notification appliance dB settings as directed by the Owner, Engineer, or Authority Having Jurisdiction (final scope of adjustments to be established by the Engineer following acceptance testing).
14. Provide all other testing required by NFPA 72 but not specified herein.

B. Test a minimum of 10% of existing devices and circuits that were directly or indirectly affected by renovations.

C. Document all testing in accordance with the National Fire Alarm Code. Submitted documentation shall include but shall not be limited to the following items:

1. Fully completed Partial NFPA-72 Record of Completion form (2019 Edition).
2. Fully completed Partial NFPA-72 Inspection and Testing form (2019 Edition).

D. Upon completion, the Contractor shall conduct a functional test of the entire system for the Authority Having Jurisdiction, Owner and Engineer.

1. Additional testing and demonstration for the Authority Having Jurisdiction, Owner and Engineer shall be provided as required until the system is demonstrated to be free of unexplained alarms, troubles, faults, or any abnormalities.

E. In the event that additional software programming is necessary to complete the tests, the system shall be completely retested as outlined in this section at the contractor’s expense.

F. All components, parts and assemblies supplied by the manufacturer shall be guaranteed by the manufacturer against defects in materials and workmanship for a period of three (3) years. The equipment manufacturer shall provide normal labor service as required during this period at no cost to the Owner and shall respond to any call within two (2) hours 24 hours a day, seven days per week.

G. The equipment manufacturer shall have a local branch office or authorized factory distributor staffed with trained, full-time employees who are capable of performing testing, inspection, repair and maintenance services for the life of the fire alarm system.

3.8 COMPLETION

A. Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and the like and leave the premises clean, neat and orderly.

B. Certification:

1. The contractor shall certify in a letter to the Engineer that the complete system has been checked in accordance with the required NFPA-72 testing standards and has been installed in accordance with the contract documents and that all items have been labeled.

C. Training: Not applicable.

D. Two (2) weeks prior to the final completion, provide to the Owner (through the engineer) a complete printout of the system programming along with flash drive copy of the program. The flash drive shall include all manufacturer’s software necessary to perform maintenance and adds. Software shall be installed on the Owner's computer as directed by Owner. Moves and changes to the system shall be provided to the Owner two (2) weeks prior to the final completion.

3.9 SPARE PARTS Not applicable

3.10 KEYS

A. Keys and locks for all equipment shall be identical where possible. Provide not less than six keys of each type required. Identify keys by an appropriate number stamped on each key or on a metal tag attached thereto. Provide a key numbering chart in the operation and maintenance manual furnished.

END OF SECTION

REPORT OF GEOTECHNICAL EXPLORATION

AMSC CENTER EXPANSION
MIDLANDS TECHNICAL COLLEGE, AIRPORT CAMPUS
1260 LEXINGTON DRIVE
WEST COLUMBIA, SOUTH CAROLINA

Prepared For:
Midlands Technical College
1260 Lexington Drive
West Columbia, South Carolina 29170

BLE Project Number 25-25810
April 28, 2025

BUNNELL LAMMONS ENGINEERING
720 Gracern Road, Suite 132, Columbia, SC 29210
803.832.1380 803.832.1379 info@blecorp.com
BLECORP.COM

BUNNELL LAMMONS ENGINEERING

April 28, 2025

Midlands Technical College
1260 Lexington Drive
West Columbia, South Carolina 29170

Attention: Mr. Tommy Wise

Subject: **Report of Geotechnical Exploration**
AMSC Center Expansion
Midlands Technical College, Airport Campus
West Columbia, South Carolina
BLE Project No. 25-25810

Mr. Wise:

Bunnell-Lammons Engineering, Incorporated (BLE) is pleased to present this report of geotechnical exploration for the proposed AMSC Center Expansion at the Midlands Technical College, Airport Campus located at 1260 Lexington Drive in West Columbia, South Carolina.

This exploration was performed generally as described in Bunnell-Lammons Engineering (BLE) Proposal No. 25-25810P dated March 25, 2025. The exploration was authorized on March 31, 2025, by the signature of Mr. Tommy Wise on our Proposal Acceptance Sheet.

Sincerely,

BUNNELL-LAMMONS ENGINEERING, INC.

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER GARY L. WEEKLEY No. 10398 4-28-25

Alex Skoler, E.I.T.
Engineering Associate

Kevin Morgan, P.E.
Geotechnical Engineer
Registered, SC #39160

Gary L. Weekley, P.E.
Senior Engineer
Registered, SC #10398

SOUTH CAROLINA BUNNELL-LAMMONS ENGINEERING, INC. No. C01452 CERTIFICATE OF AUTHORIZATION

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1.0 EXECUTIVE SUMMARY

This Executive Summary is intended as an overview of the geotechnical conditions that are expected to affect design and construction. The following summarizes the main findings of the exploration, particularly those that have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. The information provided in the executive summary should not be used in lieu of reading the entire geotechnical report.

The geotechnical conditions at the site of the proposed ASMC expansion located at the Midlands Technical College Airport Campus in West Columbia, South Carolina, were explored by drilling two soil test borings to depths of approximately 20 and 50 feet below the existing ground surface. A summary of the findings and recommendations are as follows:

- The soil test borings encountered approximately 7 to 8 inches of asphalt pavement underlain by approximately 2 to 3 feet of fill material classified as medium dense poorly graded sand with silt (SP-SM). The fill material is underlain primarily by Coastal Plain native very loose to loose poorly graded sand with silt (SP-SM) and silty clayey sand (SC-SM) to a depth of 33 feet below the existing ground surface. Below a depth of 33 feet, boring B-2 encountered stiff sandy silt (ML), medium dense clayey sand (SC) and very stiff plastic clay (CH).
- Groundwater was not encountered during the subsurface exploration.
- Building loads can be supported on shallow foundations designed using an allowable bearing pressure of 3,000 psf.
- The shallow spread foundations shall have minimum dimensions of 24 inches for column footings and continuous/strip footings. The minimum embedment depth for foundations is 18 inches below the final exterior grade.
- Floor slab subject to forklift traffic should be designed by structural engineer.
- The proposed structure may have a slab-on-grade bearing on approved coastal plain soils or engineered fill, provided the subgrade is evaluated and prepared as outlined in this report.
- Grade slab should have a minimum 6-inch thick compacted gravel base course to support forklift traffic.
- Engineered fill can be placed in maximum 8-inch loose lifts to 95% of the standard Proctor maximum dry density and 98% of the standard Proctor maximum dry density in the top 24-inch thickness of fill placement.
- Pavements can be supported directly on approved Coastal Plain soil or engineered fill, provided the subgrades are evaluated and prepared as outlined in this report.
- Rigid (concrete) pavements are recommended for all locations planned for forklift traffic due to the high wheel and shear loads which can degrade asphalt pavement.
- It is recommended that BLE conduct a geotechnical review of the project plans (prior to issuance for construction) to confirm that BLE's geotechnical recommendations have been properly interpreted and implemented.

2.0 AUTHORIZATION

A geotechnical exploration for the proposed AMSC Center Expansion located at the Midlands Technical College Airport Campus in West Columbia, South Carolina was performed generally as described in Bunnell-Lammons Engineering (BLE) Proposal No. 25-25810P dated March 25, 2025. The exploration was authorized on March 31, 2025, by the signature of Mr. Tommy Wise on our Proposal Acceptance Sheet.

3.0 SCOPE OF EXPLORATION

This report presents the findings of the geotechnical exploration performed for the proposed AMSC Center Expansion located at 1260 Lexington Drive in West Columbia, South Carolina (reference Figure 1, Appendix A). The intent of this exploration was to evaluate the subsurface soil and groundwater conditions at the site to provide geotechnical recommendations for design of the foundations, pavements, and associated project elements. We have also included a discussion of secondary design considerations and provided geotechnical related construction recommendations.

4.0 PROJECT INFORMATION

The following project information was provided in a request for proposal (RFP) from Mr. Tommy Wise to our Mr. Kevin Morgan. Included with the RFP were civil drawings in which included an existing site and demolition plan, site plan, and additional civil drawings. The plans were dated with an original date of August 2013 and a revision date of September 2014.

It is proposed to construct an expansion of the existing AMSC Center Building. The new expansion will be one story and fabricated as an I-beam structure adjoining to the existing building. The proposed expansion will be used for construction classes including use of a forklift. Based on our review of available online aerial imagery and our recent site visit, the site is occupied by the AMSC Center building with an associated metal canopy attached on the west side of the building. Ground cover for the expansion predominately consists of asphalt pavement.

Structural information provided to us by Mr. Tommy Wise consists of wheel loads of 7.5 kips and maximum column loads of 20 kips. Grading information was not available at this time. However, we anticipate the expansion structure will be at a similar elevation as the existing structure, therefore we expect minimal (less than 5 feet) of earthwork cut and/or fill will be required for construction.

5.0 FIELD EXPLORATION

5.1 Soil Test Borings

The site was explored by drilling two soil test borings (ASTM D1586) at the approximate locations shown on the attached Boring Location Plan (reference Figure 2, Appendix A). Borings, B-1 and B-2, located within the proposed expansion limits, were advanced to depths of 20 and 50 feet, respectively. A description of our field procedures is also included in Appendix C. The borings were located and logged by our Mr. Alex Skoler by referencing the provided site plan and identifiable site landmarks. Boring elevations were

estimated using publicly available sources. Boring logs are presented in the Appendix D of this report. The boring locations and elevations shown in the Appendix should be considered approximate.

6.0 SITE GEOLOGY

The site is located within the Atlantic Coastal Plain Physiographic Province of South Carolina. The soils in this province are generally interbedded silts, sands, and clays that have been deposited during successive advances and retreats of the ocean over the past several million years. Along rivers the marine deposits have, in more recent times, been successively eroded and overlain by alluvial (water-deposited) soils.

Most formations within the Coastal Plain were laid down in a shallow sloping sea bottom, tilting gradually toward the sea at the rate of a few feet per mile. During periods of relatively low sea level, the old bottom deposits emerged, forming plains tilting toward the sea. These plains were subsequently eroded by coastal streams which formed shallow troughs in an otherwise uniform stratum. During periods of relatively high sea level, the former troughs were inundated and filled with more recent sediments. Consequently, many of the formations in the Coastal Plain exist as fractional erosional remnants sandwiched within more continuous strata.

7.0 SUBSURFACE CONDITIONS

Beneath an approximate 7 to 8-inch layer of asphalt pavement across the site, the borings encountered fill and native coastal plain soils. The fill material encountered consisted of a medium dense to dense poorly graded sand with silt (SP-SM). The native Coastal Plain soils underlying the fill material consists primarily of very loose to loose poorly graded sand with silt (SP-SM) and silty clayey sand (SC-SM) to a depth of 33 feet below the ground surface. Underlying the SC-SM soils, interchanging layers of stiff sandy silt (ML), medium dense clayey sand (SC) and very stiff fat clay (CH) were encountered to a termination depth of 50 feet. The letters in parentheses represent a visual classification of the soils in accordance with the Unified Soil Classification System. A key to symbols and classification is included as Appendix E.

The above descriptions provide a summary of the subsurface conditions encountered. The boring logs included as Appendix D contain detailed information recorded at each boring location. The boring logs represent our interpretation of the field logs based on engineering examination of the field samples and soil laboratory testing. The lines designating the interfaces between various strata represent approximate boundaries and the transition between strata may be gradual. It should be noted that the soil conditions will vary between boring locations.

7.1 Groundwater

Groundwater was not encountered by the borings. It should be noted that groundwater levels may fluctuate several feet with seasonal changes, rainfall variations and with changes in the water level in adjacent drainage features. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall.

8.0 LABORATORY TESTING

A summary of the laboratory testing is presented in the following Table 1:

Table 1: Laboratory Index Test Results

Boring ID	Sample Depth (feet)	Soil Description	Natural Moisture Content (%)	Atterberg Limits			Percent Gravel (%)	Percent Fines (%)	USCS
				LL	PL	PI			
B-01	3.5 – 5.0	Poorly Graded Sand with Silt	5.1	NV	NP	NP	0.0	11.1	SP-SM
B-02	8.5 – 10.0	Silty Clayey Sand	7.6	21	17	4	0.0	12.2	SC-SM

Note: NP: Non-Plastic, NV: Non-Viscous

These laboratory tests were used to assist in soil classifications as well as foundation and pavement recommendations. The laboratory test results are presented in Appendix B along with a discussion of the laboratory test procedures.

9.0 ANALYSIS AND DESIGN RECOMMENDATIONS

9.1 Foundations

Structural information provided to us consists of maximum building column loads of 20 kips and wheel point loads of 7.5 kips. Based on our review of the boring and laboratory data and our experience with similar project conditions, the encountered native Coastal Plain soils are suitable for use for shallow foundation support, however these soils should be densified as specified in the following sections. The recommendations below assume that the site has been prepared in accordance with the Construction Recommendations section of this report.

Given the provided load of 20 kips, foundations bearing in approved coastal plain soils may be sized for an allowable bearing pressure of 3,000 pounds per square foot (psf). We recommend that the native bearing soils in the foundation excavations be densified with multiple passes of a vibratory compactor prior to placement of steel reinforcement. Foundations bearing on new engineered fill that is placed on densified native soil and compacted to at least 98 percent of the standard Proctor maximum dry density (ASTM D698), as recommended later in this report, may also be sized for an allowable bearing pressure of 3,000 psf.

We recommend that the minimum width for individual column and continuous wall footings be 24 inches. The minimum width will provide a margin of safety against a local or punching shear failure of the foundation soils. There is a minimal frost depth at the project site, however footings should bear at least 18 inches below final exterior grade to provide sufficient bearing capacity embedment considerations. We recommend that walls be provided with movement joints to accommodate some possible differential settlement.

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain open for long periods of time. Therefore, we recommend that once each foundation excavation is extended to final grade, the foundation be constructed as soon as possible to minimize the potential damage to loose soil, ponded water, and debris. Foundation concrete should not be placed on soils that have been disturbed by seepage. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom prior to placement of concrete. If the excavation must remain open overnight or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 2 to 4-inch thick "mud-mat" of "lean" (2,000 psi) concrete be placed on the bearing soils for protection before the placement of reinforcing steel.

To verify that the soils encountered in footing excavations are similar to those encountered by the soil test borings, we recommend that foundation excavations be examined. Part of this examination should include checking the bearing soils to a depth of 3 feet with a dynamic cone penetrometer (DCP) performed by an experienced engineering technician working under the direction of the geotechnical engineer.

9.2 Settlement

We conducted settlement estimates assuming conventional shallow spread foundations were used to support the structure. The settlement estimates are based on the maximum loading information provided to us as indicated in Section 9.1. Assuming foundations are designed and constructed in accordance with the recommendations presented in this report, we estimate the total foundation settlement to be less than 1-inch. Maximum differential settlement between adjacent similarly loaded foundations is estimated to be approximately ½-inch or less.

9.3 Lateral Earth Pressure

Retaining walls must be capable of resisting the lateral earth pressures that will be imposed on them. Walls which will be permitted to rotate at the top, such as cantilever retaining walls, may be designed to resist the active earth pressure. The active earth pressure coefficient is designated as Ka. Typically, a top rotation of about 1 inch per 10 feet height of wall is sufficient to develop active pressure conditions in soils similar to those encountered at the site. We recommend a Ka value of 0.33 for the soils encountered at this site when placed in accordance with the requirements for engineered fill.

Walls which will be prevented from rotating such as underground storage tank pits should be designed to resist the at-rest lateral earth pressure. The at-rest earth pressure coefficient is designated as Ko. We recommend a Ko value of 0.5 for the soils encountered at this site in their natural state or when placed in accordance with the requirements for engineered fill.

The passive earth pressure may be considered as the pressure exerted on the side of a foundation which aids in resisting sliding of the foundation. The passive earth pressure coefficient is designated as Kp. Friction resistance along the base of the foundation may also be used to resist sliding. The coefficient of frictional resistance is designated as fs. We recommend a fs value of 0.4 and a Kp value of 3.0 for the soils encountered

at this site. Consideration should be given to dividing the passive earth pressure coefficient by a safety factor of 2 to limit the amount of lateral deformation required to mobilize the passive resistance. Published documentation[1] indicates that very little horizontal compression (approximately 0.5% relative to wall height) is required to develop one-half of the available passive resistance, hence the suggested safety factor of 2. However, depending on soil type and relative density it may take 2 to 15% horizontal compression to develop the full passive resistance.

The values presented above assume that the ground surface is level. Sloping backfill (or sloping soil surfaces in front of a footing when considering passive resistance) will dramatically influence the earth pressure coefficients. Bunnell-Lammons Engineering should be consulted concerning applicable earth pressure coefficients where sloping soil surfaces may be present.

The compacted mass unit weight of the backfill soil, which we estimate to be approximately 125 pcf, should be used with the earth pressure coefficients to calculate lateral earth pressures. Lateral pressure arising from surcharge loading, earthquake loading, and groundwater should be added to the above soil earth pressures to determine the total lateral pressures which the walls must resist. Where practical, we recommend that retaining walls and other below grade walls incorporate filtered gravity drainage systems to prevent the buildup of excess hydrostatic pressures behind the walls. In addition, transient loads imposed on the walls by construction equipment during backfilling should be taken into consideration during design and construction. Excessively heavy grading equipment should not be allowed within about 5 feet horizontally of the walls.

9.4 Seismic Site Classification

Geotechnical seismic design requirements are detailed in the International Building Code. The seismic site class is determined based on the soil/rock properties within the upper 100 feet.

It was beyond the scope of this exploration to drill borings extending to a depth of 100 feet and there was no rock encountered within the depths explored. In accordance with the International Building Code (IBC) Section 1613 (2021) and ASCE 7-16, a Site Class D shall be used when soil properties are not known in sufficient detail to determine the Site Class unless the building official determines that Site Class E or F soil is likely to be present at the site. Based on our knowledge of the area and the conditions encountered in the soil test borings, we recommend that the structure be designed using a seismic Site Class D.

Table 2: Seismic Acceleration Parameters (IBC 2021 / ASCE 7-16)

Site Class	S_S (g)	S_1 (g)	PGA (g)	F_a	F_{PGA}	S_{DS} (g)	S_{D1} (g)	PGA_M (g)	Seismic Design Category RC I-IV
D	0.346	0.114	0.196	1.523	1.409	0.352	0.18	0.276	II

[1] *Soil Mechanics* by T. William Lambe and Robert V. Whitman; Massachusetts Institute of Technology; 1969; p.165.

9.5 Grade Slabs

Building grade slabs may be soil supported assuming that the native soils are densified in accordance with the recommendations in this report. Grade slabs that will have forklift traffic should have a minimum 6-inch-thick compacted gravel base course underlying a minimum 6-inch-thick concrete slab. Grade slabs should be designed by the structural engineer. The grade slab should be jointed around columns and along footing supported walls so that the slab and foundations can settle differentially without damage. This jointing is not required when slabs and foundations are cast as a monolithic unit (i.e. thickened edge foundations). If slab thickness permits, joints containing dowels or keys may be used in the slab to permit movement between parts of the slab without cracking or sharp vertical displacements.

Based on the soils encountered at the site, we recommend a modulus of subgrade reaction, k, of 225 pci for use in design of slabs and dumpster pads. This modulus value is for a one-foot square plate.

Floor slabs supported on grade which will be carpeted, tiled, painted or receive some other covering or sealant should incorporate a vapor barrier. The vapor barrier should be installed in accordance with the requirements of ACI 302 and per the manufacturer's recommendations.

9.6 Pavement

A site-specific pavement design requires detailed information about projected traffic frequency and intensity, acceptable service limits, life expectancy and other factors. For the purpose of this report, light duty pavement is considered to be subject to automobile traffic, such as a car parking lot. Heavy duty pavement is considered to be subject to an occasional loaded delivery truck and garbage trucks. Pavement planned to have forklift traffic should be designed as rigid concrete pavement because of the high wheel and shear loads.

Presented in the table below are recommended pavement sections based on the assumed traffic type/frequency, our evaluation of the laboratory test results and our experience with similar projects in this region. Assuming the site is prepared in accordance with the recommendations of this report, the pavement sections presented below could be expected to provide adequate performance considering a 15- to 20-year service life.

Table 3: Pavement Recommendations

Pavement Type	Layers	Material	Thickness (Inches)	
			Light Duty	Heavy Duty
Flexible	a.	Asphaltic concrete surface course	2.0	3.0
	b.	Aggregate base course	6.0	8.0
Rigid	a.	Concrete	6.0	6.0
	b.	Aggregate base course	6.0	6.0

The asphaltic concrete should conform to the South Carolina Department of Transportation Supplemental Technical Specification for Hot-Mix Asphalt Material Properties (SCDOT Designation: SC-M-402) Type C HMA Surface Course and Type C HMA Intermediate Course. The stone base course should meet the requirements of Section 305 of SCDOT Standard Specifications for Macadam base. The base course should be compacted to 100 percent of the standard Proctor (ASTM D698) maximum dry density.
The concrete for rigid pavement should be air-entrained and have a minimum flexural strength (third point loading) of 550 psi which could likely be achieved by a concrete mix having a compressive strength of at least 4,000 psi at 28 days. Recommended air contents from the Portland Cement Association (PCA) are as follows:

Maximum Aggregate Size	Percent Air
1½ inches	5 percent plus or minus 1½ percent
¾ to 1-inch	6 percent plus or minus 1½ percent

In addition, we recommend a maximum slump of 4 inches for plastic concrete.

Joint spacing for the recommended concrete thickness should be on the order of 12 to 15 feet. Control joints should be sawed as soon as the cut can be made, without raveling (aggregate pulling out of the concrete matrix) or cracks forming ahead of the saw blade. Joints should be sawed consecutively so that the joints commence working together. The American Association of State Highway and Transportation Officials (AASHTO) suggests that transverse contraction joints should be one quarter of the slab thickness and longitudinal joints should be one third of the slab thickness. All joints should be filled with flexible joint filler.

Curing of the concrete slab should begin as soon as the slab has been finished and the joints sawed. Moist curing by fog spray nozzles or wet burlap is the most dependable curing procedure. Other methods of curing could consist of spray applied curing compounds or covering the slab with waterproof paper or heavy plastic. If paper or plastic is used for curing, the edges of the cover should be anchored and joints between sheets should be taped or sealed.

Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations, and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

It is advisable to use rigid (concrete) pavement in areas where forklift traffic is expected, as these vehicles exert significant point loads that can cause ruts in asphalt surfaces. The recommended rigid pavement sections consist of unreinforced plain Portland Cement Concrete (PCC). For dumpster pads and the approaches to dumpsters, we suggest utilizing reinforced PCC pavement. Additionally, these pads should also be designed using a modulus of subgrade reaction value, k, of 225 pci.

9.7 Secondary Design Considerations

The following items are presented for your consideration. These items are known to enhance performance of structural and pavement systems.

- Roof drainage should be collected by a system of gutters and downspouts and directed away from all structures.
- Sidewalks should be sloped so that water drains away from the structures.
- Site grading and paving should result in positive drainage away from the structures. Water should not be allowed to pond around the structures or in such locations that would lead to saturation of pavement subgrade materials. A minimum slope of approximately ¼ to ½-inch per foot should provide adequate drainage.
- Backfill for utility lines should be placed in accordance with the requirements for engineered fill to minimize the potential for differential settlement.

10.0 CONSTRUCTION RECOMMENDATIONS

10.1 Clearing and Grubbing

All existing asphalt pavement, topsoil, vegetation, trees, stumps, disturbed soils, unsuitable soils and surface soils containing organic matter or other deleterious materials should be stripped from within the proposed building and pavement areas. Topsoil and organic soils may be stockpiled for later use in areas to be landscaped. Other deleterious material should be disposed of offsite or in areas of the site that will not be developed.

10.2 Drainage

Groundwater was not encountered by the borings at the time of drilling of our exploration. However, it should be noted that groundwater levels may fluctuate several feet with seasonal and rainfall variations and with changes in the water level in adjacent drainage features. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall. The contractor should be prepared to promptly remove any surface water or groundwater from the construction area. This has been done effectively on past jobs by means of gravity ditches and pumping from filtered sumps. At this time, we do not expect groundwater to affect the proposed construction.

10.3 Proofrolling

After stripping and rough excavation grading, we recommend that areas to provide support for the foundations, floor slab, engineered fill, and pavement be carefully inspected for soft surficial soils and proofrolled with a 25 to 35-ton, four-wheeled, rubber-tired roller, or similar approved equipment. The proofroller should make at least four passes over each location, with the last two passes perpendicular to the first two where practical.

Any areas which wave, rut, or deflect excessively and continue to do so after several passes of the proofroller should be excavated to firmer soils. The excavated areas should be backfilled in thin lifts with engineered fill.

The proofrolling and excavating operations should be carefully monitored by an experienced engineering technician working under the direction of the geotechnical engineer. Proofrolling should not be performed when the ground is frozen or wet from recent precipitation.

10.4 Engineered Fill

All fill used for raising site grade or for replacement of material that is undercut should be uniformly compacted in thin lifts, no greater than 8-inch-thick loose lift, to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). In addition, at least the upper 24 inches of subgrade fill beneath pavements and floor slabs exposed to forklift traffic should be compacted to at least 98 percent of the standard Proctor maximum dry density. We recommend that the fill be placed and compacted at a moisture content within three percent of the standard Proctor optimum moisture content.

Based on our visual examination, laboratory testing, and experience with similar soil types, most of the on-site soil appears to be suitable for use as engineered fill with proper moisture adjustment. Soils having a Plasticity Index (PI) greater than 30 (less than 15 is preferable) should not be used for fill. Soils used for engineered fill should be reasonably free from organics (less than 3% organics by weight), should contain particles no larger than 3-inches, and should exhibit a standard Proctor maximum dry density greater than 90 pcf. The near surface soils encountered across the site primarily classify as poorly graded sand with silt (SP-SM) and silty clayey sand (SC-SM) and may be used as engineered fill.

Before filling operations begin, representative samples of each proposed fill material should be collected and tested to determine the compaction and classification characteristics. The maximum dry density and optimum moisture content should be determined for each type of fill soil. Once compaction begins, a sufficient number of density tests should be performed by an experienced engineering technician working under the direction of the geotechnical engineer to measure the degree of compaction being obtained. Existing slopes steeper than 6:1 (horizontal:vertical) should be benched prior to placement of engineered fill such that the fill is placed in horizontal layers and keyed into the existing slopes.

The edge of engineered fill extending above surrounding grade should extend horizontally beyond the outside edge of the building foundations at least 10 feet or a distance equivalent to the height of fill to be placed, whichever is greater, before sloping. The edge of fill should extend at least 5 feet beyond paved areas. Fill slope surfaces should be protected from erosion by grassing or some other means.

The surface of compacted subgrade soils can deteriorate and lose its support capabilities when exposed to environmental changes and construction activity. Deterioration can occur in the form of freezing, formation of erosion gullies, extreme drying, exposure for a long period of time or rutting by construction traffic. We recommend that the surfaces of floor slab and pavement subgrades that have deteriorated or softened be recompacted prior to construction of the floor slab or pavement. Additionally, any excavations through the subgrade soils (such as utility trenches) should be properly backfilled in compacted lifts. Recompaction of subgrade surfaces and compaction of backfill should be checked with a sufficient number of density tests to determine if adequate compaction is being achieved.

10.5 Slopes

Confined temporary excavations such as for utility installation or below-grade wall construction should conform to OSHA regulations. For permanent slopes which are not confined, our experience suggests that excavation side slopes through the existing soil overburden at the site should be laid back at a 2H:1V (horizontal to vertical) slope or flatter. Permanent fill slopes placed on a suitable foundation should be constructed at 2.5:1, or flatter. Fill slopes should be adequately compacted. Cut and fill slope surfaces should be protected from erosion by grassing or other means. Permanent slopes of 3:1 or flatter may be desirable for mowing.

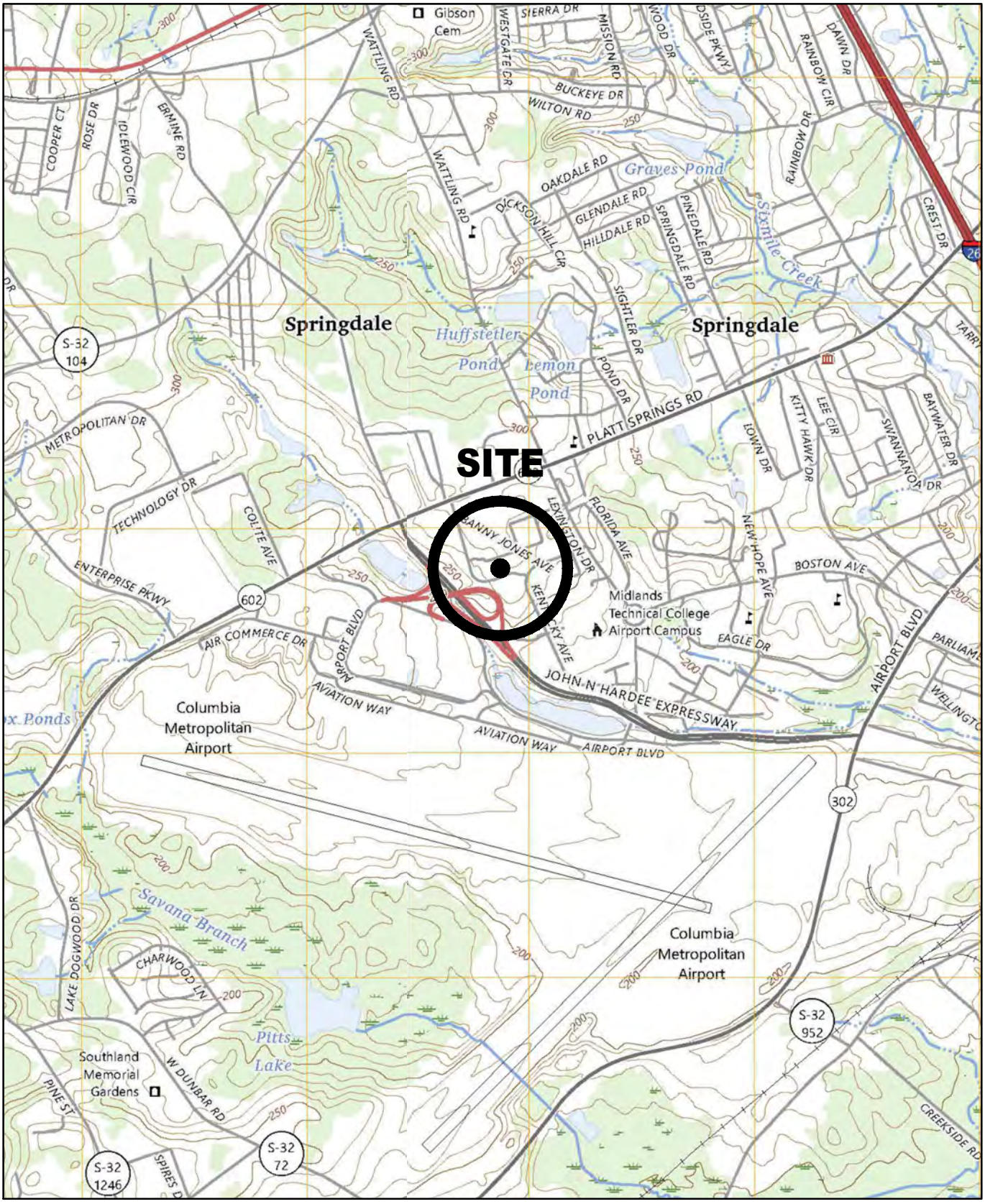
11.0 SPECIFICATIONS REVIEW

It is recommended that Bunnell-Lammons Engineering be retained to make a review of the foundation and earthwork plans and specifications prepared from the recommendations presented in this report. We would then suggest any modifications so that our recommendations are properly interpreted and implemented.

12.0 BASIS OF RECOMMENDASTIONS

Our evaluation of foundation support conditions has been based on our understanding of the project information and data obtained in our exploration as well as our experience on similar projects. The generalized subsurface conditions utilized in our foundation evaluation have been based on interpolation of the subsurface data between the widely spaced borings. Subsurface conditions between the borings may differ. If the project information is incorrect or the structure location (horizontal or vertical) and/or dimensions are changed, please contact us so that our recommendations can be reviewed. The discovery of any site or subsurface conditions during construction which deviate from the data obtained in this exploration should be reported to us for our evaluation. The assessment of site environmental conditions for presence of pollutants in the soil, rock and groundwater of the site was beyond the scope of this exploration. Soil cuttings used as backfill in boreholes will settle over time resulting in a depression at the surface. It is beyond the scope of our services to return to the site to repair boreholes that have exhibited settlement of the backfill soils.

APPENDIX A
Figures

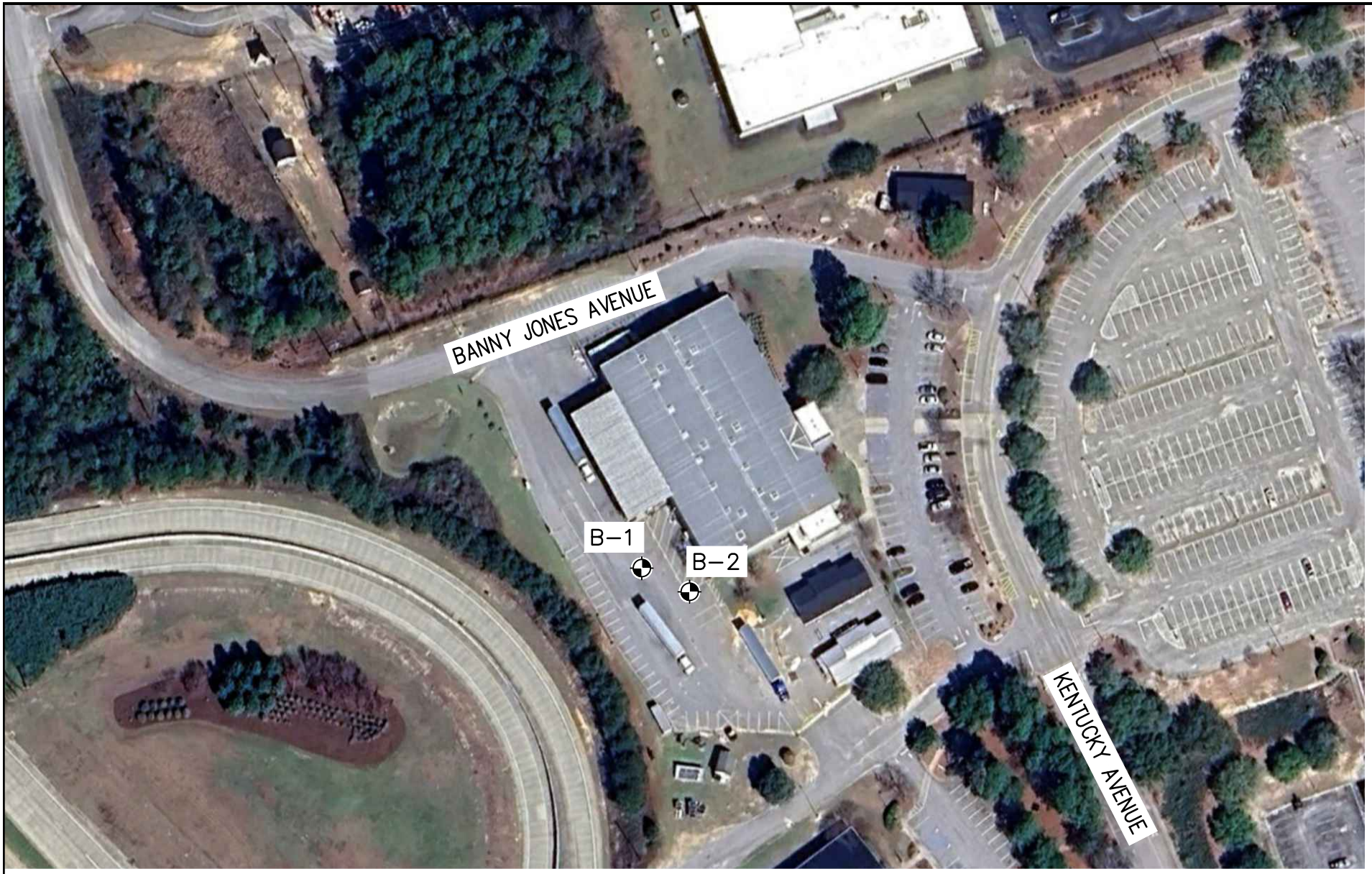


2000 1000 0 2000 4000

APPROXIMATE SCALE IN FEET

REFERENCE:
USGS TOPOGRAPHIC MAP, 7.5 MINUTE SERIES,
SOUTHWEST COLUMBIA AND LEXINGTON, S.C. QUADRANGLE, 2024.

DRAWN: ENC	DATE: 4-8-25	BUNNELL LAMMONS ENGINEERING	FIGURE
CHECKED: KRM	CAD: AMSC EXPANSION	720 Gracern Rd, Ste 132 Columbia, SC 29210 Phone: (803) 832-1380 Fax: (803) 832-1379	SITE LOCATION MAP AMSC CENTER EXPANSION MIDLANDS TECHNICAL COLLEGE, AIRPORT CAMPUS WEST COLUMBIA, SOUTH CAROLINA
APPROVED: KRM	JOB NO: 25-25810		1



150 75 0 150 300

APPROXIMATE SCALE IN FEET

LEGEND:

SOIL TEST BORING ⊕ B–1

REFERENCE:

1. GOOGLE EARTH IMAGE DATED 3–7–2025.

DRAWN: ENC	DATE: 4–8–25
CHECKED: KRM	CAD: AMSC EXPANSION
APPROVED: KRM	JOB NO: 25–25810

BUNNELL LAMMONS ENGINEERING
720 Gracern Rd, Ste 132 Columbia, SC 29210
Phone: (803) 832-1380 Fax: (803) 832-1379

BORING LOCATION PLAN
AMSC CENTER EXPANSION
MIDLANDS TECHNICAL COLLEGE, AIRPORT CAMPUS
WEST COLUMBIA, SOUTH CAROLINA

FIGURE

2

APPENDIX B
Laboratory Test Procedures and Results

BUNNELL LAMMONS ENGINEERING

Laboratory Test Procedures

NATURAL MOISTURE CONTENT

The natural moisture content of selected samples was determined in accordance with ASTM D2216. The moisture content of the soil is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the soil particles.

GRAIN SIZE DISTRIBUTION

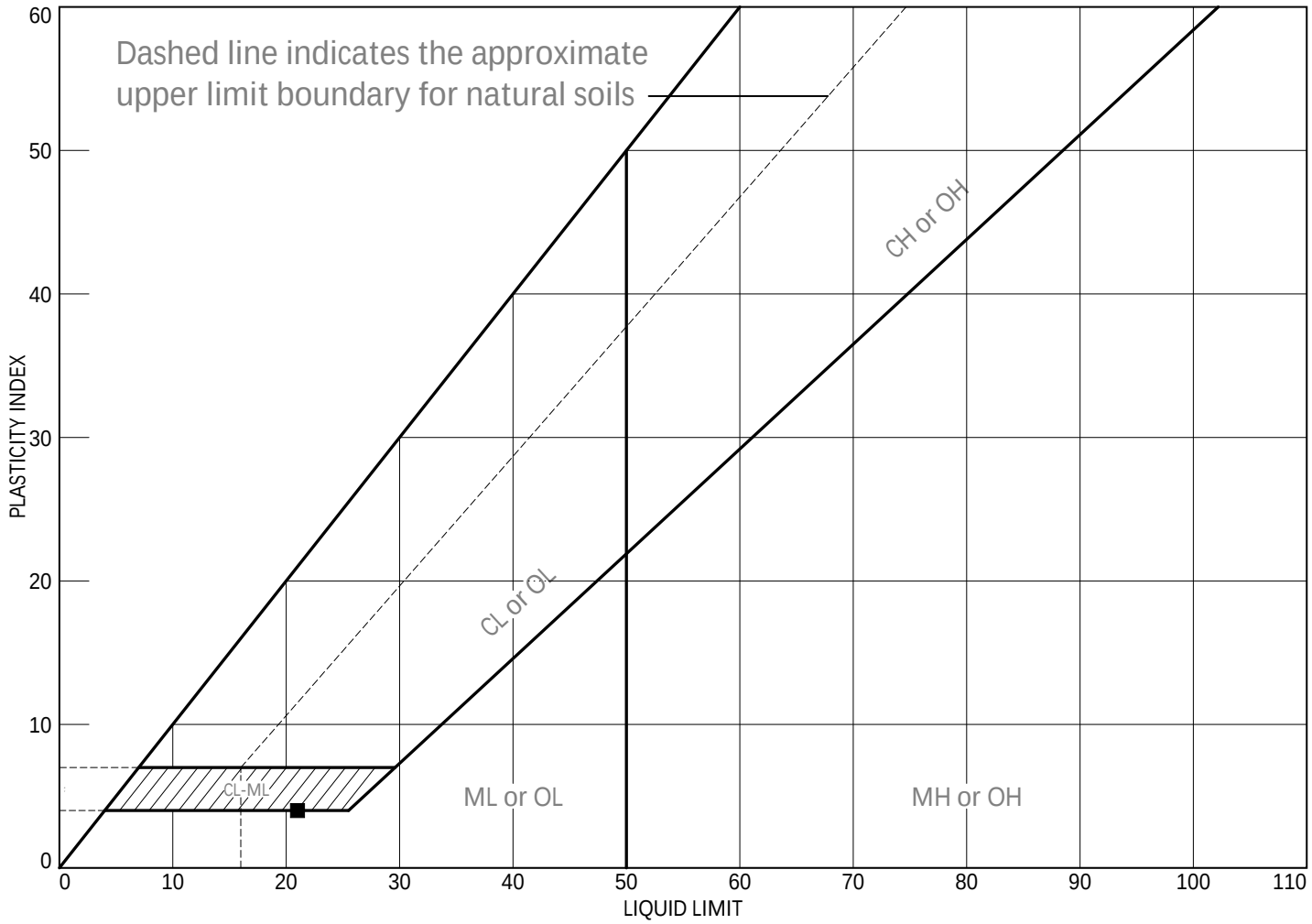
Grain size tests were performed on selected soil samples to determine the particle size distribution of these materials. After initial drying, the samples were washed over a U.S. Standard No. 200 Sieve to remove the fines (particles finer than a No. 200 mesh sieve). The samples were then dried and sieved through a standard set of nested sieves. This test was performed in accordance with ASTM D6913. The results are presented as percent finer by weight versus particle size curves.

SOIL PLASTICITY

Representative samples were selected for Atterberg Limits testing to determine their soil plasticity characteristics. The soil's Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). These characteristics are determined in accordance with ASTM D4318. The LL is the moisture content at which the soil will flow as a heavy viscous fluid. The PL is the moisture content at which the soil begins to lose its plasticity.

Certain soils swell and shrink with increases and decreases in soil moisture. The PI is related to this potential volume change ability. When such volume changes occur in soils confined beneath foundations, floor slabs, and pavements, structural deformations can be produced. Past experience has shown that soils having a PI of less than 30 are only slightly susceptible to volume changes. Soils having a PI greater than 50 are generally very susceptible to these volume changes. Soils with a PI between these limits have moderate volume change potential.

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	Borings	B-1	3.5-5.0 Ft.	5.1	NP	NV	NP	SP-SM
■	Borings	B-2	8.5-10.0 Ft.	7.6	17	21	4	SC-SM

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Greenville, SC

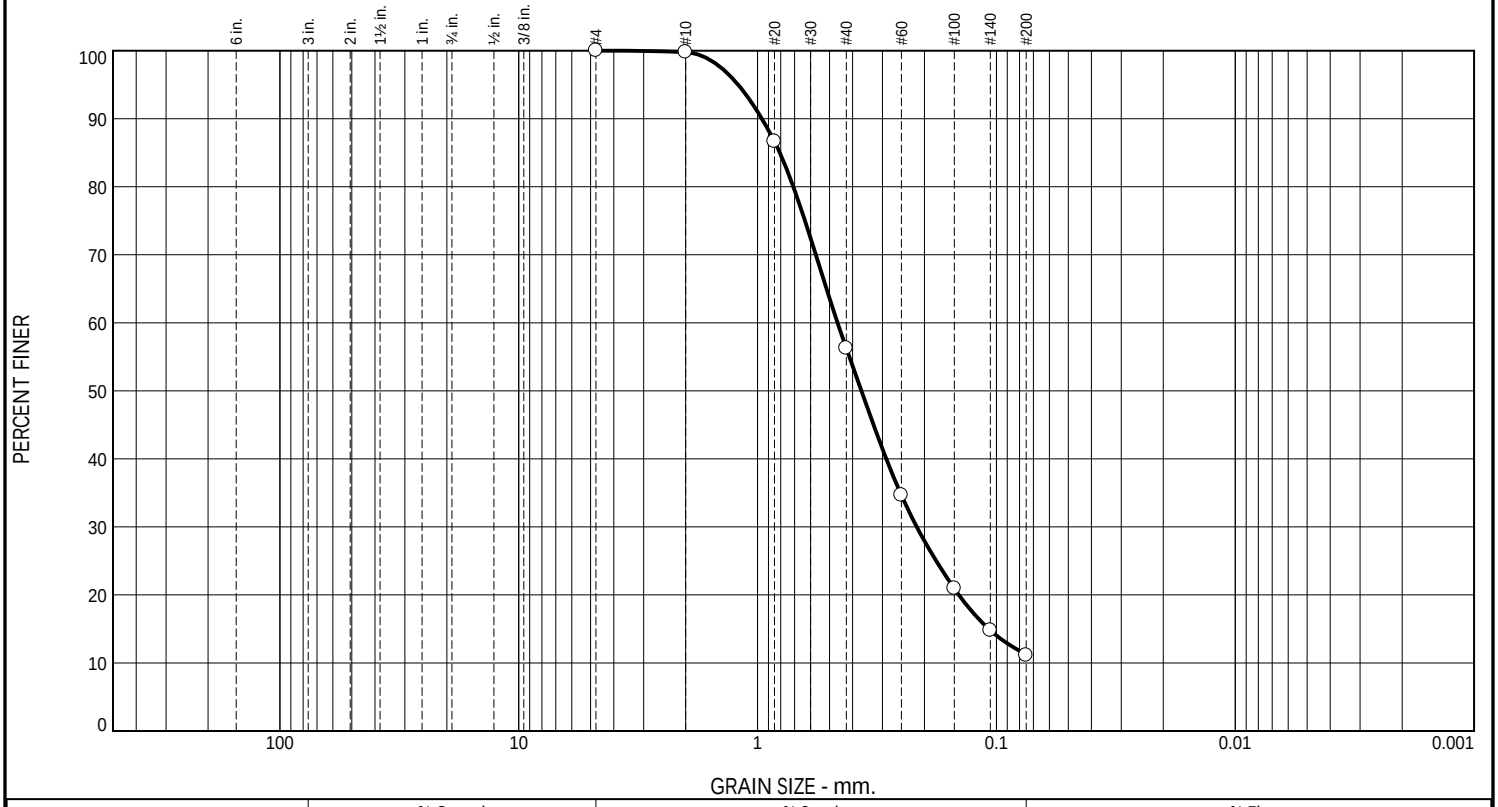
Client: Midlands Technical College
Project: AMSC Center Expansion

Project No.: 25-25810 Figure 1

Tested By: JT Checked By: KM

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	43.5	45.2	11.1	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#4	100.0			
#10	99.8			
#20	86.7			
#40	56.3			
#60	34.7			
#100	20.9			
#140	14.8			
#200	11.1			

* (no specification provided)

Material Description

Poorly Graded Sand with Silt (SP-SM), light brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.9591 D_{85}= 0.8067 D_{60}= 0.4626
D_{50}= 0.3674 D_{30}= 0.2155 D_{15}= 0.1077
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Test Remarks

Source of Sample: Borings Depth: 3.5-5.0 Ft.
Sample Number: B-1 Sample Date: 4/7/2025

Bunnell Lammons Engineering, Inc.

Greenville, SC

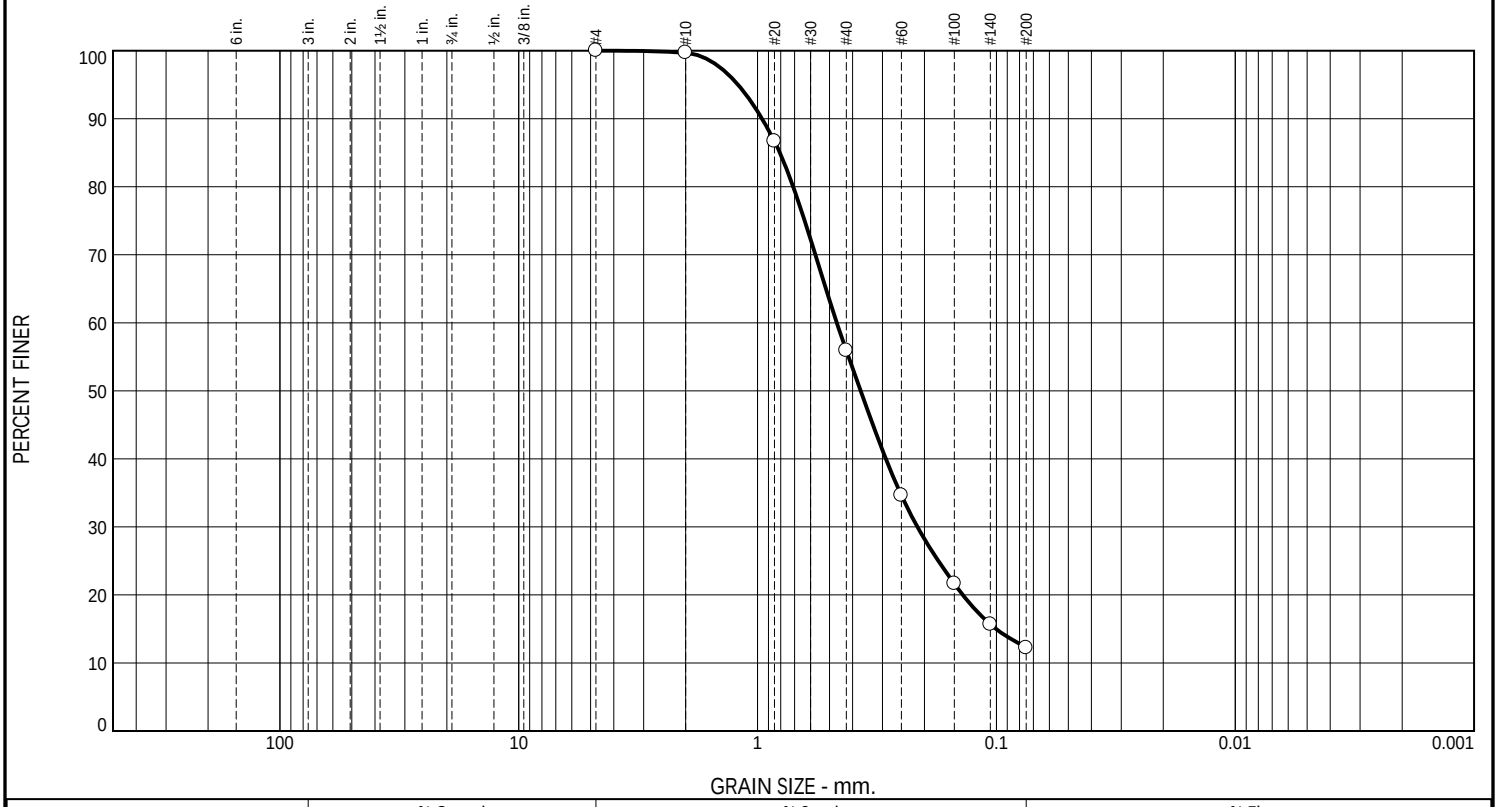
Client: Midlands Technical College
Project: AMSC Center Expansion

Project No: 25-25810 Figure 2

Tested By: JT Checked By: KM

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	43.8	43.7	12.2	

Test Results (ASTM D6913)

Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
#4	100.0			
#10	99.7			
#20	86.7			
#40	55.9			
#60	34.6			
#100	21.6			
#140	15.7			
#200	12.2			

* (no specification provided)

Material Description

Silty Clayey Sand (SC-SM), reddish brown

Atterberg Limits

PL= 17 LL= 21 PI= 4

Coefficients

D_{90}= 0.9580 D_{85}= 0.8064 D_{60}= 0.4659
D_{50}= 0.3700 D_{30}= 0.2141 D_{15}= 0.1005
D_{10}= C_u= C_c=

Classification

USCS= SC-SM AASHTO= A-2-4(0)

Test Remarks

Source of Sample: Borings Depth: 8.5-10.0 Ft.
Sample Number: B-2 Sample Date: 4/7/2025

Bunnell Lammons Engineering, Inc.

Greenville, SC

Client: Midlands Technical College
Project: AMSC Center Expansion

Project No: 25-25810 Figure 3

Tested By: JT Checked By: KM

APPENDIX C
Field Exploration Procedures

BUNNELL LAMMONS ENGINEERING

Field Exploration Procedures

SOIL TEST BORINGS – HOLLOW STEM AUGERS WITH SPT

The soil borings were made by mechanically twisting a continuous flight steel auger into the soil. Soil standard penetration testing (SPT) were performed in general accordance with ASTM D1586. At assigned intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches to 18 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the second and third 6-inches was recorded and is designated the "standard penetration resistance," or “N-Value.” The penetration resistance, when properly evaluated, is an index to the strength of the soil and foundation supporting capability.

Representative portions of the soil samples, thus obtained, are collected in glass jars or sealed bags and transported to our laboratory. In the laboratory, the samples were examined by a geotechnical engineer to verify the field classifications and to conduct selected laboratory tests. Boring Logs are attached, showing the soil descriptions and penetration resistance.

LOCATIONS AND ELEVATIONS

Test boring elevations and coordinates were obtained using publicly available software and are shown on Figure 2 in Appendix A. Elevations and coordinates should be considered approximate, and are only as accurate as the means used to obtain them.

APPENDIX D
Boring Logs

BUNNELL LAMMONS ENGINEERING
720 Gracern Rd, Ste 132, Columbia, SC 29210
(803) 832-1380

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNCAL AND ENVIRONMENTAL CONSULTANTS

SOIL TEST NO. B-01

PROJECT: AMSC Center Expansion	PROJECT NO.: 25-25810	
CLIENT: Midlands Technical College	START: 04/04/2025	END: 04/04/2025
LOCATION: 1260 Lexington Dr, West Columbia, SC 29170, USA	GS ELEVATION: 277	
NORTHING/EASTING: 770445.68 N, 1963551.63 E		
DRILLER: W Walker Environmental, R. Hook	LOGGED BY: A. Skoler	
DRILLING METHOD: Geoprobe 7822DT; direct push 2 1/4 inch HSA		
DEPTH TO - WATER> INITIAL: ▽ N/A	AFTER 24 HOURS: ▼ N/A	CAVING: 15.5

Water	Depth (ft)	Elevation (m)	Description	Graphic Log	SPT Testing	SPT N-Value (0 10 20 30 40 50 60 70 80 90 100)
		276.4	Asphalt - 7 inches			
		275	Poorly graded Sand With Silt (SP-SM): medium dense, brown, moist, fine to medium grained sand, - (fill)		17, 12, 13	●
		273.5	Poorly graded Sand With Silt (SP-SM): loose, light brown, moist, fine to medium grained sand, - (coastal plain)		3, 3, 3	●
	5	270			2, 2, 3	●
			Silty Clayey Sand (SC-SM): loose, light brown, moist, fine to medium grained sand		3, 4, 4	●
	10	265	orange brown		3, 4, 4	●
	15	260			3, 4, 4	●
			B-01 Terminated at 20ft			

BUNNELL LAMMONS ENGINEERING
720 Gracern Rd, Ste 132, Columbia, SC 29210
(803) 832-1380

SOIL TEST NO. B-02

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNCAL AND ENVIRONMENTAL CONSULTANTS

PROJECT: AMSC Center Expansion		PROJECT NO.: 25-25810
CLIENT: Midlands Technical College	START: 04/04/2025	END: 04/04/2025
LOCATION: 1260 Lexington Dr, West Columbia, SC 29170, USA		GS ELEVATION: 278
NORTHING/EASTING: 770422.72 N, 1963576.47 E		
DRILLER: W Walker Environmental, R. Hook		LOGGED BY: A. Skoler
DRILLING METHOD: Geoprobe 7822DT; direct push 2 1/4 inch HSA & 2 1/4 inch HSA		
DEPTH TO - WATER> INITIAL: ▽ N/A	AFTER 24 HOURS: ▼ N/A	CAVING: 21

Depth (ft)	Elevation (m)	Description	SPT Testing
	277.3	Asphalt - 8 inches	
	275	Poorly graded Sand With Silt (SP-SM): dense, brown, moist, fine to medium grained sand, - (fill)	12, 18, 14
5		Poorly graded Sand With Silt (SP-SM): very loose, orange brown, moist, fine to medium grained sand, - (coastal plain)	5, 2, 2
	270	Silty Clayey Sand (SC-SM): loose to dense, orange, moist, fine to medium grained sand	2, 3, 3
10			2, 3, 3
	265		4, 5, 5
15			
	260		5, 5, 6
20			
	255		6, 7, 6
25			
	250		4, 15, 20
30			
	245	Sandy Silt (ML): stiff, orange and gray, moist	3, 5, 10
35			
	240	Clayey Sand (SC): medium dense, orange, gray, moist, fine to medium grained sand	4, 11, 17
40			
	235	Fat Clay (CH): very stiff, gray, moist	4, 9, 12
45			
	230	Clayey Sand (SC): medium dense, orange and gray, moist, fine to medium grained sand	9, 12, 14

B-02 Terminated at 50ft

SPT N-Value ● 0 10 20 30 40 50 60 70 80 90 100

APPENDIX E
A Key to Soil Classification

KEY TO SOIL CLASSIFICATIONS AND CONSISTENCY DESCRIPTIONS

BUNNELL-LAMMONS ENGINEERING, INC.

Penetration Resistance* Blows per Foot

SANDS

Blows per Foot	Relative Density
0 to 4	Very Loose
5 to 10	Loose
11 to 30	Medium-Dense
31 to 50	Dense
over 50	Very Dense

Particle Size Identification

Boulder:	Greater than 300 mm
Cobble:	75 to 300 mm
Gravel:	Coarse - 19 to 75 mm
	Fine - 4.75 to 19 mm
Sand:	Coarse - 2 to 4.75 mm
	Medium - 0.425 to 2 mm
	Fine - 0.075 to 0.425 mm
Silt & Clay:	Less than 0.075 mm

Penetration Resistance* Blows per Foot

SILTS AND CLAYS

Blows per Foot	Consistency
0 to 2	Very Soft
3 to 4	Soft
5 to 8	Firm
9 to 15	Stiff
16 to 30	Very Stiff
31 to 50	Hard
over 50	Very Hard

*ASTM D 1586

KEY TO DRILLING SYMBOLS


Bulk Sample


Split Spoon Sample


Undisturbed Sample


Groundwater Table at Time of Drilling


Groundwater Table 24 Hours After Completion of Drilling


Cave-in Depth

KEY TO SOIL CLASSIFICATION


Well-graded Gravel
GW


Poorly-graded Gravel
GP


Partially Weathered Rock
PWR


Fill
FILL


Fat Clay
CH


Lean Clay
CL


Sandy Clay
CL


Silty Clay
CL-ML


Elastic Silt
MH


Silt
ML


Sandy Silt
ML


Topsoil
TOPSOIL


Well Graded Sand
SW


Poorly Graded Sand
SP


Clayey Sand
SC


Silty Sand
SM

APPENDIX F
Important Information About This Geotechnical Engineering Report

IMPORTANT INFORMATION ABOUT THIS

GEOTECHNICAL-ENGINEERING REPORT

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

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

Bunnell-Lammons Engineering, Inc. (BLE) has prepared this advisory to help you interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and their development, which for decades have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, reach to your BLE contact.

Understand the Geotechnical-Engineering Services Provided for this Report

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

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

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

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

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

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

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

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

Read this Report in Full

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

You Need to Inform Your Geotechnical Engineer About Change

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

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

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

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

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

This Report's Recommendations Are Confirmation-Dependent

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

This Report Could Be Misinterpreted

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

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

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

Give Constructors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

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

Geoenvironmental Concerns Are Not Covered

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

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

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