Martin Luther King Jr. Recreation Center

VOLUME 1 OF 2

705 14th Court East
Panama City, Florida 32401

New community center and gymnasium with associated sitework amenities and parking.

CCR Project 21109

STATE OF FLORIDA
TAMMY DANIELS COHEN
Tammy D. Cohen
AR0015450
REGISTERED ARCHITECT

OWNER
City of Panama City, Florida
501 Harrison Avenue
Panama City, Florida 32401

ARCHITECT
CCR Architecture & Interiors
2920 First Avenue South
Birmingham, Alabama 35233

Roman Gary
roman@ccrarchitecture.com
05/18/2023

CCR ARCHITECTURE & INTERIORS

PROJECT MANUAL

FOR

MARTIN LUTHER KING JR.

RECREATION CENTER

705 14TH COURT EAST

PANAMA CITY, FLORIDA 32401

PROJECT CCR–21109

MAY 18, 2023

COHEN CARNAGGIO REYNOLDS
Architecture & Interior Design
2920 First Avenue South
Birmingham, Alabama 35233
205/324-8864 phone
Florida Registration No. AR0015450

COHEN CARNAGGIO REYNOLDS
2920 First Avenue South
Birmingham, Alabama 35233
(205) 324-8864 tel

Project No. CCR—21109
May 18, 2023

SPECIFICATION FOR
MARTIN LUTHER KING JR. RECREATION CENTER
705 14TH COURT EAST - PANAMA CITY, FL 32401
CONTRACT SPECIFICATIONS

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END OF VOLUME 2

END OF INDEX

MARTIN LUTHER KING JR. RECREATION CENTER
PC24-009
CITY OF PANAMA CITY, FLORIDA

Bids for Martin Luther King Jr. Recreation Center will be received electronically via Bonfire by the City of Panama City until 10:00 AM CT, on Thursday, December 21, 2023. Bids will be taken to Room 010, lower level of City Hall and opened publicly. You may submit bids electronically through the City's Bonfire Portal at https://www.panamacity.bonfirehub.com/portal/?tab=openOpportunities. If you have questions or need assistance with alternative methods of submission, please contact Dawn Kirkland a purchasing@panamacity.gov.

The estimated cost of the construction project equals or exceeds $250,000. The voluntary pre-bid conference and site visit is scheduled for 10:00 AM CT, on Tuesday, November 28, 2023 at City Hall, 501 Harrison Avenue, lower level, Room 010 Panama City, Florida, 32401.

The project consists of constructing the master plan for re-building the Martin Luther King Jr. Recreation Center site on a City-owned plot of approximately four (4) acres at the corner of 15th Street and Martin Luther King Jr. Boulevard. The project includes all site work, buried and above ground utilities, landscaping, signage, a 30,000 sq ft building comprising a 12,000 sq ft Community Center and an 18,000 sq ft Gymnasium, an outdoor basketball court, a natural turf soccer field, a playground, other play courts, walkways, pavilions, a memorial wall and statue, a drop off round-about, parking areas, and two stormwater retention ponds. All the master plan construction described in the project drawings and specifications is included in this bid and eventual contract with the City.

The work will be awarded in one contract.

The successful bidder will be required to submit a list of his/her subcontractors with the bid package for approval before award of contract.

The instructions to Bidders, Bid, Contract Agreement, Drawings, Specifications and forms of Bid Bond, Performance Bond, Payment Bond and other Contract Documents may be examined at the following:

City of Panama City, Purchasing Division
501 Harrison Avenue, Room 238
Panama City, FL 32401

All bid documents including Plans, Specifications and Addenda may be obtained by emailing Dawn Kirkland, purchasing@panamacity.gov. Partial sets of Bidding Documents will not be available directly from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents including Addenda, if any, obtained from sources other than the Issuing Office.

Each Bid must be accompanied by a Bid Bond, prepared on the form of Bid Bond attached to the Contract Documents or a Surety Company's Standard Bid Bond, duly executed by the Bidder as principal and having as surety thereon a surety company licensed to do business in the State of Florida and listed as a certified company in the latest issue of U.S. Treasury Circular 570, in the amount of five percent of the Bid.

No bid may be withdrawn within 90 calendar days after the scheduled time for receipt of bids.

All bidders must be licensed and shall comply with all licensing requirements of the State of Florida. All bidders must comply with all applicable State and Local laws concerning licensing, registration, and regulation of contractors doing business in the State of Florida. Further, contractors shall obtain all such occupational licenses and permits as shall be prescribed by law.

The person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid for a contract to provide any goods or services to a public entity, may not submit a bid for a contract to a public entity for the construction or repair of a public building or public work, may not submit bids for leases of real property to a public entity, may not be awarded a contract or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may no transact business with any public entity in excess of the threshold amount provided in Section 287.017, for Category Two for a period of 36 months from the date of being placed on the convicted vendor list.

Contractor must ensure employees and applicants for employment are not discriminated against because of their race, color, religion, sex or national origin.

The Owner will in no way be liable for any cost incurred by any bidder in the preparation its Bid in response to this invitation to Bid.

The successful Bidder for this Contract will be required to furnish a satisfactory Performance Bond and Payment Bond each in the amount of 100 percent of the Bid.

The Owner reserves the right to reject any or all Bids, to waive informalities an to readvertise.

City of Panama City, Florida
Purchasing Division

Advertisement starts November 08, 2023 and runs for 44 days.

END OF SECTION

DOCUMENT 00 21 13 - INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701 – 2018, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A701 - 2018, "Instructions to Bidders," is bound in this Project Manual.

END OF DOCUMENT 00 21 13

AIA® Document A701™ – 2018

Instructions to Bidders

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

«Martin Luther King Jr. Recreation Center »
«705 East 14th Court, Panama City, FL 32401»
«Project Description: New community Center and Gymnasium with associated sitework Amenities and parking. »

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

«City of Panama City, Florida »« »
«501 Harrison Avenue »
«Panama City, Florida 32401 Owner's Representative: City of Panama City, FL - PMO Office C/O Dawn Kirkland purchasing@panamacity.gov »

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

«CCR Architecture and Interiors »« »
«2920 1st Avenue, South »
«Birmingham. Alabama 35233»

TABLE OF ARTICLES

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

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

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

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

ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

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

All bid documents including Plans, Specifications and Addenda may be obtained in a pdf format by emailing Dawn Kirkland at purchasing@panamacity.gov. Partial sets of Bidding Documents will not be available directly from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents including Addenda, if any, obtained from sources other than the Issuing Office.

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper

documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

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

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

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

§ 3.2 Modification or Interpretation of Bidding Documents

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

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

«Via email to: Dawn Kirkland purchasing@panamacitygov.org

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least fifteen (15) days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

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

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

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

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

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

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders by the issuing office via email to all potential bidders who have requested the bid documents.

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

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

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

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

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

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

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

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

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

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

§ 4.2 Bid Security

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

«Utilize AIA Form A310. Bid bonds must be made payable to Owner in an amount of five percent (5%) of Bidder's maximum Bid price (determined by adding the base bid and all alternates).»

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

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

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning «90 »days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

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

Bids may be submitted electronically through the City's Bonfire Portal at http://www.panamacity.bonfirehub.com/portal/?tab=openOpportunities or may be delivered to the PMO Department, City Hall, 501 Harrison Avenue, Room 238, Panama City, Florida 32401. The City's preference is that all submissions go through the City's Bonfire Portal but will continue to accept paper submissions. Please contact Dawn Kirkland at purchasing@panamacity.gov should you require assistance.

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

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

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

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

§ 4.4 Modification or Withdrawal of Bid

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

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

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

« Bid security will be returned via mail to the bidder upon confirmation of bid withdrawal. »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

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

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

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

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

ARTICLE 6 POST-BID INFORMATION
§ 6.1 Contractor's Qualification Statement
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

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

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

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

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

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

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

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

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND
§ 7.1 Bond Requirements
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.

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

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

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

« »

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

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

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

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

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

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

« »

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

« »

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

« »

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

« »

.5 Drawings

Number	Title	Date
« »		

.6 Specifications

Section	Title	Date	Pages
« »			

.7 Addenda:

Number	Date	Pages
« »		

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

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

« »

[« »] The Sustainability Plan:

Title	Date	Pages
« »		

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

Document	Title	Date	Pages
« »			

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

« »

DOCUMENT 00 22 13 – SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701-2018, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.2 ARTICLE 1 Definitions

A. Add Section 1.9:

1. Procurement of contracting shall be as defined as in AIA 201-2017 Article 1.

1.3 ARTICLE 2 - BIDDER'S REPRESENTATIONS

A. Add Section 2.1.3.1:

1. 2.1.3.1 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.

B. Add Section 2.1.7:

1. 2.1.7 - The Bidder is a properly licensed Contractor according to the laws and regulations of the state of Florida and meets qualifications indicated in the Procurement and Contracting Documents.

C. Add Section 2.1.8:

1. 2.1.8 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

D. Add Section 2.1.9:

1. 2.1.9 - The Bidder acknowledges that the Project may be partially funded with federal funds and therefore understands and agrees that all required federal contract provisions shall apply to all Bids. See exhibit D to AIA A101-2017.

E. Add Section 2.1.10:

1. 2.1.10 – Bidder acknowledges that Owner requires a detailed, itemized Bid as defined in Document 00 43 73 – Proposed Schedule of Values.

F. Add Section 2.1.11:

1. 2.1.11 – Bidder specifically acknowledges and affirms that as the prime contractor preparing the bid, affirmative steps have been taken to assure that minority firms, small

businesses, women's business enterprises, and labor surplus firms have been used in selecting the sub-contractors according to 2 CFR 200.321.

G. Add Section 2.1.12:

1. 2.1.12 – Bidder acknowledges and affirms that all subcontractors used by Bidder will be approved by Owner and shall meet all federal requirements. This includes all subcontractors listed in the bidding documents as well as any not listed.

1.4 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Add Section 4.1.1.1:

a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from the Owner.

2. Add Section 4.1.3.1

a. 4.1.3.1 -Owner is exempt from payment of sales and compensating use taxes of the State of Florida and of cities and counties thereof on all materials to be incorporated into the base bid.

1) Owner may elect and the Contractor shall permit the Owner to purchase materials directly as provided by Section 212.08(6), Florida Statutes and Rule 2A-1.094, Public Works Contracts, Florida Administrative Code.

2) The Contractor will provide the Owner with a list of all items of material and equipment to be used in the Project for possible selection as direct purchase items. Owner will evaluate the list and decide which items will be a direct purchase by the Owner. Owner will advise the Contractor accordingly. The Documents shall contain a statement, satisfactory to Owner, reserving Owner's option to direct purchase any materials and equipment included as part of the Project.

3) All supplies and materials to be incorporated into the work must be purchased through a purchase order sent directly to the vendor supplying the materials along with the Certificate of Tax Exemption and then the materials delivered to the Owner. The vendors invoice shall be issue to Owner, rather than to Contractor. Owner will make payment directly to the vendor from public funds.

4) Owner will take title to the tangible personal property from the vendor at the time of purchase or delivery by the vendor. Following delivery of direct purchased materials or equipment to Owner, the Contractor and Owner shall agree on the method of subsequent delivery to the Contractor for installation into the Project. Such delivery and installation shall be handled in accordance with the provisions of the Contract Documents and in a manner that will not jeopardize the Owner's exemption.

5) Contractor shall recommend to Owner a schedule for procurement of long-lead time items which will constitute part of the Work. Contractor shall expedite the delivery of long-lead time items.

6) Owner's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by Contractor, or to supplies or materials not incorporated into the Work.
7) See Exhibit A attached to this 00 22 13 document for Direct Purchasing Instructions.

3. Add Section 4.1.9:

a. 4.1.9 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract. Bidder shall separate all billing in accordance with each portion, phase or zone of the scope of work as delineated by Owner.

4. Add Section 4.1.10:

a. 4.1.10 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations, or provisions not called for. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the work.

B. 4.3 - Submission of Bids:

1. Add Section 4.3.2:

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

C. 4.4 - Modification or Withdrawal of Bids:

1. Add the following sections to 4.4.2:

a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

b. 4.4.2.2 - Owner will consider modifications to a bid by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.

c. 4.5 - Break-Out Pricing Bid Supplement:

2. Add Section 4.5:

a. 4.5 - Provide schedule of values within fifteen days of receipt of the Notice of Intent to Award.

D. 4.6 - Subcontractors, Suppliers, and Manufacturers List Bid Supplement:

1. Add Section 4.6:

a. 4.6 - Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products on AIA G705. Include those subcontractors, suppliers, and manufacturers providing work totaling three percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

1.5 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2- Rejection of Bids:

1. Add Section 5.2.1:

a. 5.2.1 - Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.

1.6 BIDDER'S QUALIFICATIONS

A. The Bidder shall complete Forms AIA A305 – 2020 Exhibits A-E and shall demonstrate the following minimum qualifications:
   1. Show completion of a project of similar scale and complexity as the Project.
   2. Be currently authorized to conduct business in the United States and have been authorized to conduct business in the United States for the last (5) five consecutive years. Have on staff an Experienced Project Manager with a minimum of (5) five years' managing projects of similar scale and complexity as the Project.

B. In addition to the above minimum qualifications, the Owner shall reference responses provided within the required AIA A305 –2020 Exhibits A-E to determine bidder qualifications.

1.7 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Time of Delivery and Form of Bonds:

   1. Delete the first sentence of Section 7.2.1 and insert the following:

      a. The Bidder shall deliver the required bonds to Owner within 15 days of the date of receipt of the Notice of Intent to Award.

   2. Delete Section 7.2.3 and insert the following:

      a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.

1.8 ARTICLE 9 - EXECUTION OF THE CONTRACT

A. Add Article 9:

   1. 9.1.1 – Subsequent to the Notice of Intent to Award, and within 15 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner, in such number of counterparts as Owner may require.

   2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.

   3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement or the date that the Bidder is obligated to deliver the executed Agreement and required bonds to Owner.

4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.

END OF DOCUMENT 00 22 13

EXHIBIT A

Direct Purchasing Instructions Supplement to the Supplementary Conditions

DIRECT PURCHASING INSTRUCTIONS

The City of Panama City (the "City") has determined that this contract shall be subject to certain sales tax exemptions pursuant to section 212.08(6), Fla. Stat. (2022). This instruction sheet is intended to inform the Contractor of the requirements of the statute and the City's procedures.

1. The Contractor will compile a list of all purchases for this project.
2. The City will issue a Certificate of Entitlement to the Contractor to affirm that the tangible personal property purchased from the vendor will go into or become a part of a public work.
3. The City's purchase order for the purchase must be attached to the Certificate of Entitlement. There must be a separate Certificate of Entitlement for each purchase order but copies of the Certificate are acceptable.
4. The City must issue the purchase order directly to the vendor.
5. The vendor's invoice must be issued to the City by delivered to the Contractor. The Contractor will approve the invoice and forward to the City for payment.
6. The City must make payment directly to the vendor.
7. The City assumes title to the materials from the vendor at the time of purchase or delivery by the vendor.
8. The City assumes the risk of damage or loss as of the time of purchase.
9. The City affirms that if the Florida Department of Revenue determines that the materials sold pursuant to the Certificate of Entitlement do not qualify for the exemption under Section 212.08(6)(b), F.S., the City will be liable for any tax, penalty, and interest determined to be due.
10. Contractors, including subcontractors, who manufacture, fabricate, or furnish materials that the Contractor incorporates into the Project, are liable for tax in the manner provided in subsection (10) of Rule 12A-1.051, F.A.C. The contractor and subcontractors, not the governmental entity, are deemed to be the ultimate consumers of the articles of tangible personal property they manufacture, fabricate, or furnish to perform their contracts and may not accept a Certificate of Entitlement for these articles.
11. Taxes are to be calculated in the following manner: If a Purchase Order amount is under $5,000.00, then the tax rate is 7.0%. For Purchase Order amounts greater than $5,000.00, then the tax rate shall be 6%.
12. Each vendor that has not done business with the City must provide a W-9 in order to receive a purchase order.

DOCUMENT 00 25 13 - PREBID MEETING

1.1 PREBID MEETING

A. Architect will conduct a Prebid meeting as indicated below:
   1. Meeting Date: November 28, 2023
   2. Meeting Time: 10:00 a.m., Central Time.
   3. Location: City Hall, 510 Harrison Avenue, Room 010, Panama City, Florida 32401.

B. Attendance:
   1. Bidders: Attendance at Prebid meeting is recommended, but not mandatory.
   2. A Zoom link will be provided.

C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of three business days prior to meeting. Questions can be submitted via email to purchasing@panamacity.gov or by hand delivery to City Hall, Attn: Dawn Kirkland, 501 Harrison Avenue, Room 238, Panama City, Florida 32401.

D. Agenda: Prebid meeting agenda may include, but is not limited to, review of topics that may affect proper preparation and submittal of bids, including the following:
   1. Procurement and Contracting Requirements:
      a. Advertisement for Bids.
      b. Instructions to Bidders.
      c. Bidder Qualifications and Experience
      d. Bidder Workload / Commitments
      e. Bonding.
      f. Insurance.
      g. Bid Security.
      h. Bid Form and Attachments.
      i. Bid Submittal Requirements.
      j. Bid Submittal Checklist.
      k. Notice of Award.
   2. Communication during Bidding Period:
      a. Obtaining documents.
      b. Bidder's Requests for Information.
      c. Bidder's Substitution Request/Prior Approval Request.
      d. Addenda.
   3. Contracting Requirements:
      a. Agreement.
      b. The General Conditions.
      c. The Supplementary Conditions.
      d. Other Owner requirements.
         a) General Contractor Scope of Work Review.
         b) Subcontractors' Scope of Work Review.
         c) Bid Forms and Price Review.

d) Construction Schedule Review.
e) Design and Constructability Review.
f) Project Interfaces Review.
g) Terms and Conditions Review.

1) Construction Price Breakdown.
a) Non-Federally Funded Work.
b) Federally Funded Work.

2) Subcontractor Qualifications and Coordination

4. Construction Documents:
a. Scope of Work.
b. Temporary Facilities.
c. Use of Site.
d. Work Restrictions.
e. Alternates, Allowances, and Unit Prices.
f. Substitutions following award.

5. Separate Contracts:
a. Work by Owner.
b. Work of Other Contracts.

6. Schedule:
a. Project Schedule.
b. Contract Time.
c. Liquidated Damages.
d. Other Bidder Questions.

7. Site Visit or Walk-through

8. Post-Meeting Addendum to Included Questions/Answers from Pre-Bid Meeting.

E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.

1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT 00 25 13

DOCUMENT 00 31 19 – EXISTING CONDITION INFORMATION

1.1 EXISTING CONDTION INFORMATION

A. This Document, with its referenced attachments, is part of the Procurement and Contracting Requirements for this Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. Site survey information is included in the bid package. The site survey does not reflect the recent demolition work.

C. The City owns all parcels comprising the Martin Luther King Jr. Recreation Center site plan except parcel 17348-000-000, 712 14th Court E, Panama City, FL 32401. This parcel is being acquired by the City at this time and is planned to be City-owned by the start of construction.

D. Related Requirements:

1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
2. Document 00 31 32 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.

END OF DOCUMENT 00 31 19

DOCUMENT 00 31 32 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document, with its referenced attachments, is part of the Procurement and Contracting Requirements for this Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

C. Geotechnical investigation reports for Project, prepared by Magnum Engineering, are available for viewing as appended to this Document.

October 14, 2021	General site conditions - Geotech Report – MLK Rec Center
January 18, 2022	Site / soil prep recommendations - Geotech Report2 – MLK Rec Center Addition Report
June 15, 2022	Foundation system design – MLK Recreation Center – Magnum Engineering

1. The opinions expressed in this report are those of a Geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a Geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.

D. Related Requirements:

1. Document 00 21 13 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 00 31 32

MAGNUM ENGINEERING INC
GEOTECHNICAL ENGINEERING CONSULTANTS

GEOTECHNICAL ENGINEERING REPORT

MLK RECREATION CENTER
PE PROJECT NO: 13066
PANAMA CITY, FLORIDA

PREPARED FOR:

PANHANDLE ENGINEERING, INC.
600 OHIO AVENUE
LYNN HAVEN, FLORIDA 32444

429 FLORIDA AVENUE
LYNN HAVEN, FLORIDA 32444
TELEPHONE (850) 258.0994

MAGNUM ENGINEERING INC
GEOTECHNICAL ENGINEERING CONSULTANTS

October 14, 2021

Mr. Chris Forehand, P.E.
Panhandle Engineering, Inc.
600 Ohio Avenue
Lynn Haven, FL. 32444

SUBJECT: MLK Recreation Center -Geotechnical Services
PE No: 13066
Panama City, Florida
MEI Project No. M121-107-274

Dear Mr. Forehand:

This letter forwards the results of our Geotechnical services for the subject site in Panama City, Florida. Our exploration consisted of Twelve (12) 5-feet deep hand auger borings and Four (4) 4"-diameter asphalt cores and patch at the locations shown on the attached Figure #1. The purpose of the cores and hand auger borings were to determine the thickness of the surface course and base material, to identify the subgrade soils present and determine groundwater levels and estimated seasonal high groundwater levels across the site. Upon completion of our field testing, the samples were brought back to the office for visual inspection, classification and analysis by our engineering staff.

Soil Conditions

The hand auger borings (HA-1 through HA-8) generally encountered slightly silty fine sands from the ground surface to the boring termination depth of 5 feet below existing grade with the exception of silty fine sands encountered in boring HA-5 from 3 ½ feet to 5 feet below existing grade.

Beneath the asphalt pavement, auger borings (C-1 through C-4) generally encountered orange clayey fine sand base having a thickness of 3 inches underlain by slightly silty and silty fine sands to the bottom of the 5-feet deep auger borings. Note that boring C-1 did not encounter any clayey fine sand base material.

The above subsurface descriptions are of a generalized nature, provided to highlight the major soil strata encountered. The Logs of Boring should be reviewed for specific subsurface conditions at each boring location. The stratifications shown on the Logs of Boring represent the subsurface conditions at the actual boring locations only, and variations in the subsurface conditions can and may occur between boring locations and should therefore be expected. The stratifications represent the approximate boundary between subsurface materials, and the transitions between strata may be gradual.

Please refer to the attached Logs of Borings presented as Figure #2 for a more detailed description of the soils encountered. Table #1 below shows the average thickness of the asphalt and base course present at each core location.

Location Number	Asphalt Thickness (inches)	Base Thickness (inches)
C-1	10" thick	No Base
C-2	3" thick	3" Orange Clayey Sand Base
C-3	3 3/4 " thick	3" Orange Clayey Sand Base
C-4	3" thick	3" Orange Clayey Sand Base

Groundwater Conditions

Groundwater was encountered at depths ranging from approximately 2.5 feet to 3.1 feet below existing grade at the time of our exploration (October 7, 2021), which was during a period of above normal seasonal rainfall. Groundwater levels will fluctuate with rainfall and could vary several feet during typical seasonal fluctuations. Larger fluctuations are possible under severe weather conditions. We recommend that the Contractor verify the actual groundwater levels at the time of construction to determine potential impacts groundwater will have on construction procedures. Please refer to the following table for existing groundwater data at each test location.

GROUNDWATER DATA

TEST LOCATION	DEPTH TO EXISTING GROUNDWATER TABLE (ft)	DEPTH TO ESTIMATED SEASONAL HIGH GROUNDWATER TABLE (ft)
C-1	3.0	3.0
C-2	3.0	3.0
C-3	3.0	3.0
C-4	3.0	3.0
HA-1	3.1	3.1
HA-2	3.1	3.1
HA-3	3.0	3.0
HA-4	3.0	3.0
HA-5	2.6	2.6
HA-6	3.0	3.0
HA-7	2.6	2.6
HA-8	2.5	2.5

Warranty and Limitations of Study

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied. Magnum Engineering, Inc. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

We wish to point out that a geotechnical study is inherently limited in that the engineering recommendations are developed from information obtained from test borings that only depict subsurface conditions at the specific locations, times and depth shown on the logs. Soil conditions at other locations may differ from those encountered in the test borings, and the passage of time may cause the soils conditions to change from those described in this report.

This report is intended for use by the designers of this project. While we have no objections to it being provided for review by parties to this project, it is not a specification document and is not to be used as a part of the specifications. If desired, we can assist in the development of specifications for this project based upon our exploration.

The nature and extent of variation and change in the subsurface conditions at the site may not become evident until the course of construction. Construction monitoring by the geotechnical engineer or his representative is therefore considered necessary to verify the subsurface conditions. If significant variations or changes are in evidence, it may be necessary to reevaluate the recommendations in this report.

Furthermore, if the project characteristics are altered significantly from those discussed in this report, if the project information contained in this report is incorrect or if additional information becomes available, a review must be made by this office to determine if any modifications in the recommendations will be necessary.

We hope this letter provides sufficient information for the present. If you have any questions or comments, please feel free to call.

Sincerely,
MAGNUM ENGINEERING. INC.

JAMES T. VICKERS, P.E.
Sr. Geotechnical Engineer
Florida Registration # 56813

JAMES T. VICKERS LICENSE No. 56813 STATE OF FLORIDA PROFESSIONAL ENGINEER

James T. Vickers, P.E.
Digitally signed by James T. Vickers, P.E.
Date: 2021.10.14 11:48:27 -05'00'

Attachments: Figure #1 – Boring Location Plan
Figure #2 – Logs of Borings

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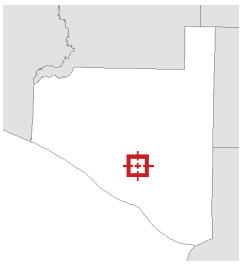
BORING LOCATION PLAN

FIGURE # 1

Overview



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MAGNUM ENGINEERING INC
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LOGS OF BORINGS

FIGURE # 2

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER C-1

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD CORE MACHINE/HAND AUGER
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Asphalt Pavement (10" thick)										
1		Tan Slightly Silty Fine SAND (SP-SM)	AU									
2												
3	▽											
4												
5		Boring Termination Depth at 5.0 feet.										

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Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER C-2

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD CORE MACHINE/HAND AUGER
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Asphalt Pavement (3" thick)										
		Orange Clayey Fine SAND (Base 3" thick) (SC)										
		Tan Slightly Silty Fine SAND (SP-SM)										
1												
2			AU									
3		▽										
4												
5		Boring Termination Depth at 5.0 feet.										

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Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER C-3

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD CORE MACHINE/HAND AUGER
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Asphalt Pavement (3 3/4" Thick)										
		Orange Clayey Fine SAND (Base 3" Thick) (SC)										
		Tan Slightly Silty Fine SAND (SP-SM)										
1												
2			AU									
3	▽											
4												
5		Boring Termination Depth at 5.0 feet.										

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Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER C-4

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD CORE MACHINE/HAND AUGER
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Asphalt Pavement (3" Thick)										
		Orange Clayey Fine SAND (Base 3" Thick) (SC)										
		Tan Slightly Silty Fine SAND (SP-SM)										
1												
2			AU									
3	▽											
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-1

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.1 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3		▽										
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-2

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.1 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3		▽										
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-3

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3		▽										
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-4

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3	▽											
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-5

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 2.6 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3		▽										
4		Dark Brown Silty Fine SAND (SM)										
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-6

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 3.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3		▽										
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-7

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 2.6 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2		▽										
3												
4		Gray/Brown Slightly Silty Fine SAND (SP-SM)										
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-8

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M121-107-274
PROJECT LOCATION Panama City, Florida
DATE STARTED 10/7/21 **COMPLETED** 10/7/21
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 2.5 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Brown/Tan Slightly Silty Fine SAND (SP-SM)	AU									
1												
2												
3		▽										
4												
5		Boring Termination Depth at 5.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER.GPJ GINT STD US LAB.GDT 10/14/21

MAGNUM ENGINEERING INC

GEOTECHNICAL ENGINEERING CONSULTANTS

GEOTECHNICAL ENGINEERING REPORT

MLK RECREATIONAL CENTER ADDITION
PANAMA CITY, FLORIDA

PREPARED FOR:

MR. WIATT LEWIS, P.E.
PANHANDLE ENGINEERING, INC.
600 OHIO AVENUE
LYNN HAVEN, FLORIDA 32444

429 FLORIDA AVENUE
LYNN HAVEN, FLORIDA 32444
TELEPHONE (850) 258.0994

MAGNUM ENGINEERING INC
GEOTECHNICAL ENGINEERING
CONSULTANTS

January 18, 2022

Mr. Wiatt Lewis, P.E.
Panhandle Engineering, Inc.
600 Ohio Avenue
Lynn Haven, Florida 32444

SUBJECT: MLK Recreational Center Addition - Geotechnical Services
Panama City, Florida
PE Project No:13066
MEI Project No. M121-107-287

Dear Mr. Lewis:

This letter forwards the results of our Geotechnical exploration for the proposed development. Our exploration consisted of Five (5) 6-feet deep hand auger borings and one (1) Double Ring Infiltrometer Test (DRI) in the proposed parking lot area and stormwater pond areas. The subsurface exploration was conducted to provide site/soil preparation recommendations, pavement recommendations, and soil related information to aid in the design of an effective stormwater management system in accordance with ERP and/or local municipal regulations.

Upon completion of our field testing, the samples were brought back to the office for visual inspection, classification, and analysis by our engineering staff.

Project Information

The subject site is located east of State Road 77, south of East 14th Street in Panama City, Florida. At the time of our exploration, the site was currently undeveloped and clear with the exception of surficial grasses. Based on the plan provided, the proposed stormwater management area will be located on the southeastern portion of the site. Based on visual inspection, the site appears relatively level with less than 3 feet of grade change across the site.

If any of the above information is incorrect, please inform Magnum Engineering, Inc. so that we can review and update our recommendations, as needed.

Subsurface Conditions

Figure #1 show the Boring Location Plan and Figure #2 shows the Logs of Borings for the Hand Auger borings HA-1 through HA-5. The test locations were established in the field using the provided plan, a 100-foot tape, and estimating right angles with reference to existing landmarks. Therefore, the test locations should be considered approximate.

The auger borings generally encountered slightly silty fine sands from the ground surface to the boring termination depth of 6-feet below existing grade with the exception of silty fine sands encountered in borings HA-1 and HA-2 from roughly 4 ½ feet to 6 feet below existing grade.

The above subsurface descriptions are of a generalized nature, provided to highlight the major soil strata encountered. The Logs of Boring should be reviewed for specific subsurface conditions at each boring location. The stratifications shown on the Logs of Boring represent the subsurface conditions at the actual boring locations only, and variations in the subsurface conditions can and may occur between boring locations and should therefore be expected. The stratifications represent the approximate boundary between subsurface materials, and the transitions between strata may be gradual.

Please refer to the attached Logs of Borings presented as Figure #2 for a more detailed description of the soils encountered.

Groundwater Conditions

Groundwater was encountered from 4.8 feet to greater than 6.0 feet below existing grade at the time of drilling (January 4, 2022), which was during a period of normal seasonal rainfall. By definition, the normal seasonal high groundwater table elevation is the highest level of the saturated zone in the soil during a year with normal rainfall. The procedure used in estimating the seasonal high groundwater table is based on adjusting the existing groundwater table encountered upward or downward, taking into consideration factors such as antecedent rainfall, redoximorphic features (identifying soil mottling) and vegetative indicators. Please refer to the table provided below for groundwater data at the boring location.

GROUNDWATER DATA

TEST LOCATION	DEPTH TO EXISTING GROUNDWATER TABLE	DEPTH TO ESTIMATED SEASONAL HIGH GROUNDWATER TABLE (ft)
HA-1	>6.0 feet	5.4 feet
HA-2	5.3 feet	4.7 feet
HA-3	4.8 feet	4.0 feet
HA-4	>6.0 feet	6.0 feet
HA-5	>6.0 feet	6.0 feet

Large fluctuations are possible under severe weather conditions. We recommend that the Contractor verify the actual groundwater levels at the time of construction to determine potential impacts groundwater will have on construction procedures.

Pavements

Initially, the pavement areas should be cleared, grubbed, and stripped of topsoil and other deleterious material. Special care should be taken to ensure that all stumps and root systems are removed from beneath the proposed pavement areas.

Prior to placing fill soils, where applicable, the top of the ground surface should be compacted to a minimum soil density of 95% of the Modified Proctor Test (ASTM D1557). Structural fill soils should be placed in maximum 12-inch lifts and compacted to a minimum soil density of 95% of the Modified Proctor Test (ASTM D1557). The top 12 inches of subgrade should be compacted to a minimum soil density of 98% of the Modified Proctor Test (ASTM D1557). The top 12 inches of subgrade should have a minimum LBR value of 40. We recommend that structural fill soils, where planned, have a minimum LBR of 40.

Based on the subsurface conditions encountered in the test borings, we recommend using a graded aggregate base (i.e. limerock or crushed concrete). The base course should be compacted to a minimum soil density of 98% of the Modified Proctor Test (ASTM D1557). We recommend the base course have a minimum LBR of 100.

Without benefit of traffic loads, volumes, and serviceability parameters, a pavement section cannot be designed. However, typical parking lots in the local area generally consist of a minimum of 1½ inches of FDOT Superpave Mix SP-12.5 or SP-9.5 asphaltic concrete and a minimum of 6 inches of base.

Moderate duty traffic areas (e.g. main entrance areas) typically have a minimum pavement section consisting of 2 inches of FDOT Superpave Mix SP-12.5 asphaltic concrete and 8 inches of base.

While specific traffic loads and volumes for the project have not been provided, we are providing recommended light-duty and medium-duty pavement sections, which have been successfully utilized for this type of commercial development in the Northwest Florida area.

Light Duty (General roadway and parking areas)

- 1 ½ inches Asphalt Concrete (FDOT Superpave Mix SP-12.5 or SP-9.5)
- 6 inches Crushed Limerock or Graded Aggregate Base (minimum LBR 100)
- 12 inches stabilized subgrade (minimum LBR 40)

Medium Duty (Entrance Lanes)

- 2 inches Asphaltic Concrete (FDOT Superpave Mix SP-12.5)
- 8 inches Crushed Limerock or Graded Aggregate Base (minimum LBR 100)
- 12 inches Stabilized Subgrade (minimum LBR 40)

The above recommended pavement sections represent minimum design thicknesses and, as such, periodic maintenance should be anticipated. Also, these recommended pavement sections should be confirmed or modified by your Civil Engineer, based on actual traffic and the owner's requirements. The pavement section materials and construction should comply with the Florida DOT and local municipality requirements.

Double Ring Infiltrometer Test

One (1) Double Ring Infiltrometer test was performed in the field in general accordance with the procedures outlined in ASTM D-3385, ``Infiltration Rate of Soils in Field using Double Ring Infiltrometers". Testing consisted of initially clearing all surface vegetation and topsoil from within the test area. The Infiltration test was performed approximately 2.0 feet below existing grade at location DRI-1. The outer ring, which is approximately 24 inches in diameter, was then driven to a depth of 6 inches below the exposed ground surface. The inner ring, approximately 12 inches in diameter, was then centrally located within the outer ring and driven to a depth of 2 inches. The two rings were then simultaneously filled with water to a height of 4 inches above the exposed ground surface test soils. The water level was maintained at this height throughout the test period, with the required amount of water added to maintain this level in both rings recorded at time intervals of 5 minutes.

The infiltration rate for the inner ring and the annular space between the rings is determined by dividing (a) the water volume used (within each specific area) during the stabilized flow period of the test, by (b) the specific area and (c) the time interval. Infiltration rates are generally converted to units of inches per hour. The infiltration rate for the inner ring, if different than the infiltration rate of the annular area between the rings, according to ASTM, should be used as the infiltration rate for the soils.

INFILTRATION DATA

LOCATION	ORIENTATION	TEST DEPTH (feet)	SUSTAINED INFILTRATION RATE (in/hr)
DRI-1	$K_{V\ (unsaturated)}$	2.0	25.5* in/hr

Note: The above infiltration rate has not been factored and is up to the designer to apply an appropriate factor of safety.

We recommend using a transformation ratio of 1 horizontal to 1 vertical (i.e. the estimated ratio of horizontal to vertical permeability).

ENVIRONMENTAL RESOURCE PERMITTING (ERP) DESIGN PARAMETERS

DESCRIPTION	LOCATION	DESIGN PARAMTER
SUSTAINED INFILTRATION RATE (K_{VU})	DRI-1	25.5 IN/HR*
TEST DEPTH	DRI-1	2.0 FT
FILLABLE POROSITY	DRI-1	30%
DEPTH TO EXISTING GROUNDWATER TABLE	DRI-1	>6.0 FT BELOW EXISTING GRADE
DEPTH TO ESTIMATED SEASONAL HIGH GROUNDWATER TABLE	DRI-1	6.0 FT BELOW EXISTING GRADE
DEPTH TO CONFINING LAYER	DRI-1	>15 FEET**

***** The above infiltration rate has not been factored and it is up to the designer to apply an appropriate factor of safety.

**Based on our experience with soils in the general area.

Warranty and Limitations of Study

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied. Magnum Engineering, Inc. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

Soil conditions at other locations may differ from those encountered in the test borings, and the passage of time may cause the soils conditions to change from those described in this report.

This report is intended for use by the designers of this project. While we have no objections to it being provided for review by parties to this project, it is not a specification document and is not to be used as a part of the specifications. If desired, we can assist in the development of specifications for this project based upon our exploration.

The nature and extent of variation and change in the subsurface conditions at the site may not become evident until the course of construction. Construction monitoring by the geotechnical engineer or his representative is therefore considered necessary to verify the subsurface conditions and to check that the soils connected construction phases are properly carried out. If significant variations or changes are in evidence, it may be necessary to reevaluate the recommendations in this report.

Furthermore, if the project characteristics are altered significantly from those discussed in this report, if the project information contained in this report is incorrect or if additional information becomes available, a review must be made by this office to determine if any modifications in the recommendations will be necessary.

We hope this letter provides sufficient information for the present. If you have any questions or comments, please feel free to call.

Sincerely,
MAGNUM ENGINEERING, INC.

JAMES T. VICKERS, P.E.
Sr. Geotechnical Engineer
Florida Registration # 56813

James T. Vickers, P.E.
Digitally signed by James T. Vickers, P.E.
Date: 2022.01.19 06:16:48 -06'00'

Attachments: Figure #1 – Boring Location Plan
Figure #2 – Logs of Borings
Figure #3 – Double Ring Infiltrometer Results

This item has been electronically signed and sealed by James T. Vickers, P.E. on the date adjacent to the seal.

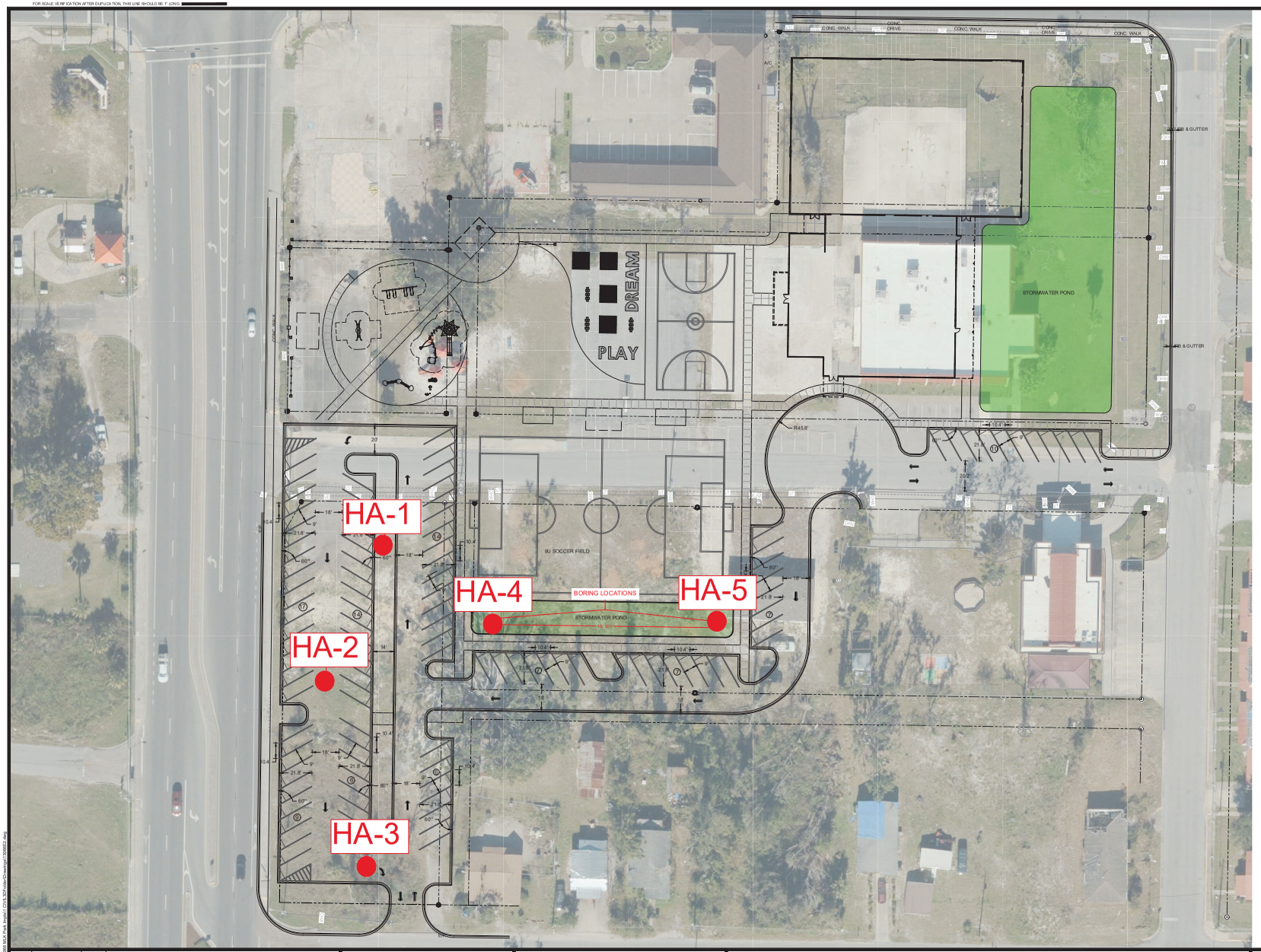
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies

MAGNUM ENGINEERING INC
GEOTECHNICAL ENGINEERING
CONSULTANTS

BORING LOCATION PLAN

FIGURE # 1

FOR SCALE VERIFICATION AFTER DUPLICATION, THIS LINE SHOULD BE 1" LONG



0' 15' 30' 60'
SCALE: 1" = 30'

PARKING STALL REQUIREMENT
STANDARD STALL 9'min.X20'min.
HC STALL 12'min.X20'min. W/5' ISLE
HC VAN STALL 12'minX20'min. W/8' ISLE
(90° PARKS)

PARKING REQUIREMENTS:
PROJECT DESCRIPTION:
GYMNASIUM 1 SPACE PER 3 SEATS
(238 SEATS)
COMMUNITY CENTER 1 SPACE PER 200 SQ. FT.
(12,000 SQ. FT.)
REQUIRED = 140
PROVIDED = 97

SITE NOTES:

1. ABOVE GROUND STRUCTURES, Etc., ARE SHOWN ON THIS SHEET.
2. ALL TRAFFIC STRIPING TO BE THERMOPLASTIC PER FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION LATEST EDITION. (WAIT MINIMUM OF 30D AYS AFTER ASPHALT CONCRETE PLACEMENT TO PLACE PERMANENT THERMOPLASTIC MARKING. TEMPORARY STRIPING TO BE PAINTED STOP BAR ONLY.)
3. ALL DISTURBED AREAS SHALL BE GRASSED UNLESS OTHERWISE NOTED. HYDROSEED SLOPES 4:1 & FLATTER, SOD SLOPES STEEPER THAN 4:1. ALL SOD TO BE STAGGERED & PINNED.
4. PLACE SOD ALONG EDGES OF NEW DRIVEWAY (10' MIN. WIDTH).
5. NO DAYTIME LANE CLOSURES ALLOWED.
6. CONTRACTOR TO FIELD VERIFY ALL UTILITIES ABOVE OR BELOW GROUND AND NOTIFY ALL UTILITY COMPANIES 2 DAYS PRIOR TO CONSTRUCTION.
7. FOR MAINTENANCE OF TRAFFIC CONTROL THROUGH WORK ZONES, REFER TO FDOT STD. PLANS INDEX 102-612 & 102-613 AS APPLICABLE.
8. ALL DEMOLISHED MATERIALS (i.e. SIGNS, CONCRETE, ASPHALT, ETC.) TO BE REMOVED AND DISPOSED OF IN LEGAL MANNER.
9. TESTING REQUIREMENTS SHALL BE IN ACCORDANCE WITH FDOT CRITERIA. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE AND SCHEDULE ALL TESTS.
10. ALL REGULATORY TRAFFIC SIGNAGE TO BE INSTALLED PER FEDERAL HIGHWAY ADMINISTRATION MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES LATEST EDITION.

LEGEND

- LIMITS OF CONSTRUCTION
- PROPOSED CONSTRUCTION
- EXISTING TO REMAIN
- PROPOSED MANHOLE (SANITARY OR STORM)
- CLEANOUT
- EXISTING MANHOLE (SANITARY OR STORM)
- PROPOSED DRAINAGE INLETS (TYPE & SIZE NOTED ON PLANS)
- EXISTING GUY ANCHOR
- EXISTING POWER POLE
- SIGN
- EXISTING FIRE HYDRANT
- PROPOSED FIRE HYDRANT
- EXISTING VALVE
- PROPOSED VALVE
- PROPOSED WATER METER BOXES
- ASPHALT — ASPHALT PAVEMENT
- HEAVY DUTY — HEAVY DUTY PAVEMENT
- CONC — CONCRETE PAVEMENT
- HC R — HANDICAP RAMP
- HC S — HANDICAP PARKING SIGN
- HANDICAP PARKING
- SEE ARCHITECTURAL PLANS
- CONC SW — CONCRETE SIDEWALK
- F-CURB — FDOT CURB i.e. MODIFIED TYPE F
- SEE NOTE — SEE NOTE THIS SHEET ie. #1
- CMP — CORRUGATED METAL PIPE
- RCP — REINFORCED CONCRETE PIPE
- R/W — RIGHT OF WAY
- EOP — EDGE OF PAVEMENT
- ℄ — CENTERLINE
- UNO — UNLESS NOTED OTHERWISE
- DWS — DETECTABLE WARNING SURFACE
- LS — LANDSCAPE AREAS
- PROPOSED ASPHALT PAVEMENT
- PROPOSED HEAVY DUTY ASPHALT PAVEMENT
- PROPOSED CONCRETE
- DETECTABLE WARNING SURFACE (DWS)

NOTES:
1. ALL EXISTING UTILITY LOCATIONS AND ELEVATIONS SHALL BE FIELD VERIFIED PRIOR TO THE START OF CONSTRUCTION.
2. CONTRACTOR TO NOTIFY ENGINEER IMMEDIATELY UPON IDENTIFICATION OF CONFLICTS.

REV.	DATE	BY	REVISIONS
NOT	RELEASED FOR CONSTRUCTION BY:		DATE:

SCALE:	AS NOTED
DESIGNED BY:	CBF
DRAWN BY:	SPL
REVIEWED BY:	CBF
ISSUE DATE:	DECEMBER 2021
ACAD FILE NAME:	13066E2.dwg

PANHANDLE ENGINEERING, INC.
ENVIRONMENTAL ENGINEERS ● CIVIL ENGINEERS ● LAND PLANNERS
600 Ohio Avenue Lynn Haven, Florida 32444
(850)763-5200 www.panhandleengineering.com

MASTER CIVIL SITE PLAN
MLK, JR. RECREATION PARK
CITY OF PANAMA CITY
PANAMA CITY, FLORIDA

James H. Sconiers, P.E. 39197
Christopher B. Rowland, P.E. 59028
Stephen E. Price, P.E. 71646
J. Doug Creek, P.E. 66558
CPR CERTIFICATION #EB-7806

CHRISTOPHER B. ROWLAND LICENSE NO. 59028 STATE OF FLORIDA PROFESSIONAL ENGINEER

SHEET NUMBER 2

PROJECT NUMBER 13066

13066 MLK, JR. RECREATION PARK CITY OF PANAMA CITY MASTER CIVIL SITE PLAN Sheet 2

MAGNUM ENGINEERING INC

GEOTECHNICAL ENGINEERING CONSULTANTS

LOGS OF BORING

FIGURE # 2

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-1

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Rec Center
PROJECT NUMBER M121-107-287
PROJECT LOCATION Panama City, Florida
DATE STARTED 1/4/22 **COMPLETED** 1/4/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR _____
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
DEPTH TO GROUNDWATER AT TIME OF DRILLING ---
LOGGED BY J. Vickers **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Gray Slightly Silty Fine SAND (SP-SM)										
		Tan Slightly Silty Fine SAND (SP-SM)										
2.5			AU									
5.0		Gray Silty Fine SAND (SM)										
		Boring Termination Depth at 6.0 feet.										

GEOTECH BH COLUMNS MLK REC CENTER.GPJ GINT STD US LAB.GDT 1/18/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-2

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Rec Center
PROJECT NUMBER M121-107-287
PROJECT LOCATION Panama City, Florida
DATE STARTED 1/4/22 **COMPLETED** 1/4/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR _____
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 5.3 ft
LOGGED BY J. Vickers **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Gray Slightly Silty Fine SAND (SP-SM)										
		Tan Slightly Silty Fine SAND (SP-SM)										
2.5			AU									
		Gray Silty Fine SAND (SM)										
5.0		▽										
		Boring Termination Depth at 6.0 feet.										

GEOTECH BH COLUMNS MLK REC CENTER.GPJ GINT STD US LAB.GDT 1/18/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-3

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Rec Center
PROJECT NUMBER M121-107-287
PROJECT LOCATION Panama City, Florida
DATE STARTED 1/4/22 **COMPLETED** 1/4/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR _____
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 4.8 ft
LOGGED BY J. Vickers **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Gray Slightly Silty Fine SAND (SP-SM)										
		Brown Slightly Silty Fine SAND (SP-SM)										
		Tan Slightly Silty Fine SAND (SP-SM)										
2.5			AU									
		Light Gray Fine SAND (SP)										
		Tan/Gray Slightly Silty Fine SAND (SP-SM) ▽										
5.0												
		Boring Termination Depth at 6.0 feet.										

GEOTECH BH COLUMNS MLK REC CENTER.GPJ GINT STD US LAB.GDT 1/18/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-4

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Rec Center
PROJECT NUMBER M121-107-287
PROJECT LOCATION Panama City, Florida
DATE STARTED 1/4/22 **COMPLETED** 1/4/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR _____
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
DEPTH TO GROUNDWATER AT TIME OF DRILLING ---
LOGGED BY J. Vickers **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Gray Slightly Silty Fine SAND (SP-SM)										
		Tan Slightly Silty Fine SAND (SP-SM)										
2.5			AU									
5.0		Boring Termination Depth at 6.0 feet.										

GEOTECH BH COLUMNS MLK REC CENTER.GPJ GINT STD US LAB.GDT 1/18/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER HA-5

CLIENT Panhandle Engineering, Inc
PROJECT NAME MLK Rec Center
PROJECT NUMBER M121-107-287
PROJECT LOCATION Panama City, Florida
DATE STARTED 1/4/22 **COMPLETED** 1/4/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR _____
GROUND WATER LEVELS:
DRILLING METHOD Hand Auger Boring
DEPTH TO GROUNDWATER AT TIME OF DRILLING ---
LOGGED BY J. Vickers **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0.0		Tan Slightly Silty Fine SAND (SP-SM)	AU									
2.5												
5.0		Boring Termination Depth at 6.0 feet.										

GEOTECH BH COLUMNS MLK REC CENTER.GPJ GINT STD US LAB.GDT 1/18/22

MAGNUM ENGINEERING INC
GEOTECHNICAL ENGINEERING
CONSULTANTS

DOUBLE RING INFILTROMETER TEST RESULTS

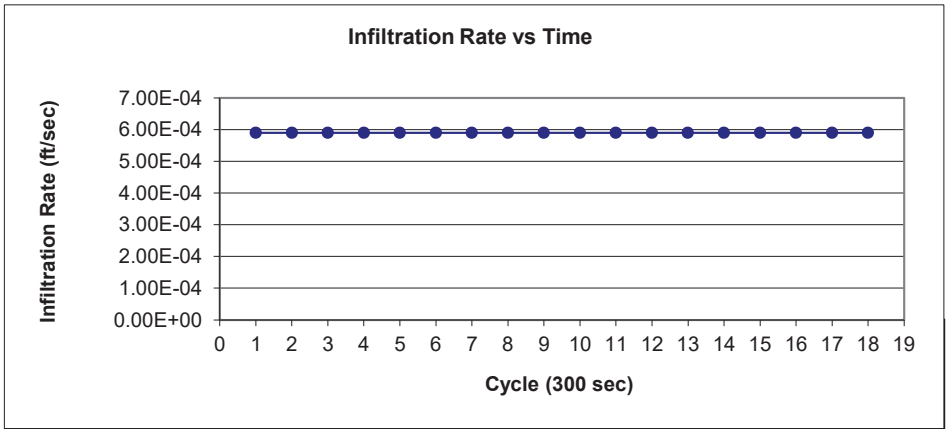
APPENDIX A

MAGNUM ENGINEERING INC
GEOTECHNICAL ENGINEERING CONSULTANTS

Double-Ring Field Infiltration Test

Test Location:	DRI-1		
Project Name:	MLK Recreation Improvements		
Project Location:	Panama City, Florida		
Test Depth:	2 ft		
Depth to GWT:	>6.0 ft		
Inner Ring Diameter:	12 in	0.3048 m	
Outer Ring Diameter:	24 in	0.6096 m	
Pre-Saturation	30 min		
Area Outer Ring:	3.1416 ft^2	0.00202683 m^2	
Area Inner Ring:	0.7854 ft^2	0.00050671 m^2	
Net Outer Ring Area:	2.3562 ft^2	0.00152013 m^2	

	Inner Ring		
Cycle	ElapTime (sec)	Vol Used (in^3)	Infiltration Rate (ft/sec)
1	300	240	5.89E-04
2	300	240	5.89E-04
3	300	240	5.89E-04
4	300	240	5.89E-04
5	300	240	5.89E-04
6	300	240	5.89E-04
7	300	240	5.89E-04
8	300	240	5.89E-04
9	300	240	5.89E-04
10	300	240	5.89E-04
11	300	240	5.89E-04
12	300	240	5.89E-04
13	300	240	5.89E-04
14	300	240	5.89E-04
15	300	240	5.89E-04
16	300	240	5.89E-04
17	300	240	5.89E-04
18	300	240	5.89E-04
Results	Sustained Rate	240	5.89E-04



Infiltration Rate: **1.80E-02 cm/sec** **25.5 in/hr**

APPENDIX A

MAGNUM ENGINEERING INC

GEOTECHNICAL ENGINEERING CONSULTANTS

GEOTECHNICAL ENGINEERING REPORT

MLK RECREATION CENTER
PANAMA CITY, FLORIDA

PREPARED FOR:

Roman Gary, AIA, NCARB, LEED AP
Vice President
CCR ARCHITECTURE & INTERIORS
2920 FIRST AVENUE SOUTH
BIRMINGHAM, ALABAMA 35233

429 FLORIDA AVENUE
LYNN HAVEN, FLORIDA 32444
magnum.engineering@yahoo.com

MAGNUM ENGINEERING INC

GEOTECHNICAL ENGINEERING CONSULTANTS

June 15, 2022

Mr. Roman Gary, AIA, NCARB, LEED AP
Vice President
CCR Architecture and Interiors
2920 First Avenue South
Birmingham, Alabama 35233

SUBJECT: MLK Recreation Center - Geotechnical Services
Panama City, Florida
MEI Project No. M122-120-556

Dear Mr. Gary:

This subsurface exploration was conducted to provide information needed in the design of an effective foundation system for the referenced development. Our exploration consisted of Five (5) 30-feet deep Standard Penetration Test (SPT) borings in the proposed building areas The following report presents the results of our study as well as our evaluation and recommendations pertaining to the geotechnical aspects of the project.

Project Information

The project site is located south of 15th Street, west of Palo Alto Avenue, and east of Cove Boulevard in Panama City, Florida. At the time of our exploration the site was developed with an existing single-story recreation building and associated pavements. Access with our track mounted drill rig was easy.

We understand that the proposed construction will consist of a new Gymnasium and Multi-purpose building. The gymnasium building will be a pre-engineered metal building with CMU walls. The multi-purpose building will be a single-story building.

Structural information provided indicate maximum wall loads of 3 kips per linear feet and maximum isolated column loads of 25 kips for the multi-purpose building. The gymnasium will have maximum wall loads of 8.6 kips per linear feet and maximum column loads of 85 kips. Grading information provided indicate the finished floor elevations will be up to 4 feet above existing site grades.

If any of the above information is incorrect, please inform Magnum Engineering, Inc. so that we can review and update our recommendations, as needed.

Scope of Geotechnical Services

As stated previously in this report, Five (5) 30-feet deep Standard Penetration Test (SPT) borings were performed at the approximate locations shown on the Boring Location Plan (BLP) attached as Figure #1. The borings were located in the field using the provided site plan, a 100-foot tape, and estimating right angles with existing structures present on site. Therefore, the boring locations should be considered approximate.

The Standard Penetration Test (SPT) borings were performed in accordance with ASTM D-1586. The borings were advanced using mud-rotary drilling with a wash bit. Split-Spoon samples were obtained using a 2-inch O.D. split spoon sampler every two feet in the top 10 feet of the borings and every 5 feet thereafter until the boring termination depth was reached.

Upon completion of the borings, the recovered soils samples were returned to our office for review and evaluation. The factual results of our subsurface exploration and soil sample review are presented herein together with geotechnical related recommendations for site-soil preparation and building support.

Soil Boring Results

The soil types encountered at the specific boring locations are presented in the form of Logs of Boring, and are attached as **Figure 2**. The stratification presented is based on visual examination of the recovered soil samples and the interpretation of field logs by a geotechnical engineer. Included with the profiles are the N-values for the SPT borings. The N-values have been empirically correlated with various soil properties and are considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive soils.

Generally, the SPT borings encountered very loose to medium dense slightly silty fine sands from the ground surface to depths of 18 to 25 feet below existing grade underlain by loose to medium dense silty fine sands and clayey fine sands and medium stiff to very stiff sandy clays to the boring termination depths of 40 feet below existing grade.

The hand auger borings (HA-1 through HA-15) generally encountered slightly silty fine sands and silty fine sands from the ground surface to the boring termination depth of 3 feet to 5 feet below existing grade.

The above subsurface descriptions are of a generalized nature, provided to highlight the major soil strata encountered. The Logs of Boring should be reviewed for specific subsurface conditions at each boring location. The stratifications shown on the Logs of Boring represent the subsurface conditions at the actual boring locations only, and variations in the subsurface conditions can and may occur between boring locations and should therefore be expected. The stratifications represent the approximate boundary between subsurface materials, and the transitions between strata may be gradual.

Please refer to the attached Logs of Boring presented as Figure #2 for a detailed description of the subsurface conditions encountered.

Groundwater Conditions

Groundwater levels were encountered between 4.0 feet and 7.0 feet below existing grade on the date of our testing (May 12, 2022), which was during a period of normal seasonal rainfall. Groundwater levels will fluctuate with rainfall and could vary several feet during typical seasonal fluctuations. Larger fluctuations are possible under severe weather conditions.

We recommend that the Contractor verify the actual groundwater levels at the time of construction to determine potential impacts groundwater will have on construction procedures. In addition, maintain positive drainage during construction activities to prevent ponding and staging of runoff adjacent to building and pavements.

CONCLUSIONS AND RECOMMENDATIONS

General

The following geotechnical related design recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there are any changes in these project criteria, including project location on the site, a review should be made by Magnum Engineering to determine if modifications to the recommendations are warranted.

Once final design plans and specifications are available, a general review by Magnum Engineering is required as a means to check that the evaluations made in preparation of this report are correct and that earthwork and foundation recommendations are properly interpreted and implemented.

Site Preparation

The site should be cleared and grubbed of surface vegetation and all remaining deleterious materials present on site. As a minimum, it is recommended the clearing operations extend at least five feet beyond the development perimeters.

Following clearing and grubbing operations, we recommend that proposed building areas be proof-rolled with a loaded dump truck to identify soft soil deposits. Yielding areas should be evaluated with test pits to determine the cause of and corrective actions required for unstable conditions.

The remaining subgrade soils should be compacted to at least 95 percent of the Modified Proctor (ASTM D-1557) maximum dry density to a depth of 12 inches below footing and floor slab bottoms.

Engineered Fill

All fill used to raise the building area to final grades should consist of sands with less than 15 percent passing the No. 200 sieve. These soils should be free of rubble, organics, clay, debris and other unsuitable material. Fill should be placed in lifts on the order of 12 inches or less (in loose thickness) and compacted to 95 percent of the soil's Modified Proctor maximum dry density, per ASTM D-1557.

FOUNDATION RECOMMENDATIONS

Gymnasium

Shallow Foundations

Based on the anticipated construction and the structural information provided, the existing site soils will not provide adequate support of the proposed structures on shallow foundations. Excessive settlements in the range of 2 inches 3 inches have been calculated.

Deep Foundations

The test borings encountered suitable subsurface conditions for founding the proposed structure on pile foundations. Table #1 below shows allowable pile capacities for various size square pre-stressed concrete piles, typically used in the area, driven with an approved pile driving hammer. Note that the allowable pile capacities assume flooded conditions, no scour, pile butt elevation at existing grade, and include a Factor of Safety of 2 in compression and tension.

TABLE #1

Pile Size	Pre-drill/Jetting Depth (Below existing grade)	Embedment (Below Existing Grade)	Tension Capacity (in tons)	Compression Capacity (in tons)
12” x 12” concrete	15.0 feet	25.0 feet	7.0	17.0
14” x 14” concrete	15.0 feet	25.0 feet	17.0	22.5

Specialty Foundations

Alternatively, we have reached out to Mrs. Mandi Petrella, P.E. with Geopier who specializes in alternative ground improvements. She has indicated that this site can be improved with geo-piers and can use up to 8 ksf allowable bearing pressure and can control settlements to 1 inch total and ½ inch differential with their design. We understand that you are currently engaged with Geopier to develop specific foundation recommendations for support of the proposed gymnasium.

Field determination of the actual pile capacities developed should be analyzed using a dynamic pile driving formula (i.e. Hiley, WAVE, etc.). This analysis requires knowledge of the piles and pile driving equipment to be used on the site.

Multi-Purpose Building

Based on the anticipated construction and site preparation requirements recommended herein, it is our opinion that the building can be supported on shallow foundations designed for a net maximum allowable bearing pressure of 2,000 pounds per square foot (psf). The following geotechnical related recommendations should be used for design and construction of the foundations.

- The foundation and floor slab should bear on properly improved existing subgrade or on properly placed and compacted cohesionless (sand) fill.
- The soils to a depth of one foot below the footings and floor slabs and all new fill should be compacted to 95 percent of the soil's Modified Proctor (ASTM D-1557) density.
- Exterior footings should be embedded so that the bottom of the foundation is a minimum of 18 inches below the adjacent compacted grades.
- Strip or wall footings should be a minimum of 18 inches wide and pad or column footings should be a minimum of three feet wide. The minimum footing sizes should be used regardless of whether or not the foundation loads and allowable bearing pressures dictate a smaller size.
- All footings should be constructed in a "dry" fashion.
- Structural elements should be centered on the footings such that the load is transferred evenly unless the footings are proportioned for eccentric loads.

Settlement

The settlement of shallow foundations supported on sandy soils should occur rapidly after loading. Most of the expected settlement should occur during construction as dead loads are imposed. Total settlements of footings are estimated to be less than 1 inch, with differential settlement on the order of 50 percent of the total settlements. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction; however, the tolerance of the proposed structures to the predicted total and differential settlements should be confirmed by the structural engineer.

Warranty and Limitations of Study

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied. Magnum Engineering, Inc. is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

Soil conditions at other locations may differ from those encountered in the test borings, and the passage of time may cause the soils conditions to change from those described in this report.

This report is intended for use by the designers of this project. While we have no objections to it being provided for review by parties to this project, it is not a specification document and is not to be used as a part of the specifications. If desired, we can assist in the development of specifications for this project based upon our exploration.

The nature and extent of variation and change in the subsurface conditions at the site may not become evident until the course of construction. Construction monitoring by the geotechnical engineer or his representative is therefore considered necessary to verify the subsurface conditions and to check that the soils connected construction phases are properly carried out. If significant variations or changes are in evidence, it may be necessary to reevaluate the recommendations in this report.

Furthermore, if the project characteristics are altered significantly from those discussed in this report, or if the project information contained in this report is incorrect and additional information becomes available, a review must be made by this office to determine if any modifications in the recommendations will be necessary.

We hope this letter provides sufficient information for the present. If you have any questions or comments, please feel free to call.

Sincerely,
MAGNUM ENGINEERING, INC.

JAMES T. VICKERS, P.E.
Sr. Geotechnical Engineer
Florida Reg. #56813

JAMES T. VICKERS LICENSE No. 56813 STATE OF FLORIDA PROFESSIONAL ENGINEER

James T. Vickers, P.E.
Digitally signed by James T. Vickers, P.E.
Date: 2022.06.15 08:40:53 -05'00'

Attachments: Figure #1 – Boring Location Plan
Figure #2 – Logs of Borings

MAGNUM ENGINEERING INC

GEOTECHNICAL ENGINEERING CONSULTANTS

BORING LOCATION PLAN

FIGURE # 1

NORTH

SITE MAP
1" = 40'-0" APPROXIMATE SCALE

DESIGN DEVELOPMENT
PRELIMINARY - NOT FOR CONSTRUCTION

CCR ARCHITECTURE & INTERIORS

PANAMA CITY MLK RECREATION CENTER

705 14TH COURT EAST
PANAMA CITY, FL 32401

JOB NUMBER:
21109

DATE:
DD 03/07/2022

PRINTED / REVISIONS
DESCRIPTION DATE

SHEET TITLE:
ARCHITECTURAL SITE PLAN

SHEET NUMBER:
A000

MAGNUM ENGINEERING INC

GEOTECHNICAL ENGINEERING CONSULTANTS

LOGS OF BORINGS

FIGURE # 2

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER B-1

CLIENT CCR Architecture & Interiors
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M122-120-556
PROJECT LOCATION Panama City, Florida
DATE STARTED 5/12/22 **COMPLETED** 5/12/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Standard Penetration Test (SPT)
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 4.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Tan Slightly Silty Fine SAND (SP-SM)	SS 1		2-3-4-5 (7)							
			SS 2		4-5-6-5 (11)							
5		Gray Slightly Silty Fine SAND (SP-SM)	SS 3		3-2-3-2 (5)							
		Gray/Brown Silty Fine SAND (SM)	SS 4		2-2-1-1 (3)							
10		Gray Slightly Silty Fine SAND with Trace of Wood (SP-SM)	SS 5		1-1-4-6 (5)							
15		Gray Slightly Silty Fine SAND (SP-SM)	SS 6		3-2-3 (5)							
20		Gray Silty Fine SAND (SM)	SS 7		4-4-4 (8)							
25		Gray Slightly Silty Fine SAND (SP-SM)	SS 8		5-5-5 (10)							
30		Gray Silty Fine SAND (SM)	SS 9		2-1-2 (3)							
		Boring Termination Depth at 30.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER 2022.GPJ GINT STD US LAB.GDT 6/2/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER B-2

CLIENT CCR Architecture & Interiors
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M122-120-556
PROJECT LOCATION Panama City, Florida
DATE STARTED 5/12/22 **COMPLETED** 5/12/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Standard Penetration Test (SPT)
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 5.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Gray/Brown Slightly Silty Fine SAND (SP-SM)	AU									
		Dark Gray Silty Fine SAND (SM)										
5		▽ Dark Gray Silty Fine SAND with Trace of Wood (SM)	SS 1		1-1-1-1 (2)							
		Dark Brown Silty Fine SAND with Wood (SM)	SS 2		1-1-1-1 (2)							
10		Gray Slightly Silty Fine SAND (SP-SM)	SS 3		1-3-5-6 (8)							
15		Gray/Tan Slightly Silty Fine SAND (SP-SM)	SS 4		4-5-5 (10)							
20		Gray Slightly Silty Fine SAND (SP-SM)	SS 5		4-2-4 (6)							
25		Dark Gray Slightly Silty Fine SAND (SP-SM)	SS 6		2-3-3 (6)							
30		Gray Slightly Silty Fine SAND (SP-SM)	SS 7		3-2-3 (5)							
		Boring Termination Depth at 30.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER 2022.GPJ GINT STD US LAB.GDT 6/2/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER B-3

CLIENT CCR Architecture & Interiors
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M122-120-556
PROJECT LOCATION Panama City, Florida
DATE STARTED 5/12/22 **COMPLETED** 5/12/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Standard Penetration Test (SPT)
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 5.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Concrete Pavement (7" Thick)										
		Tan Slightly Silty Fine SAND (SP-SM)	AU									
		Brown/Gray Slightly Silty Fine SAND (SP-SM)										
5		▽ Gray/Tan Silty Fine SAND (SM)	SS 1		4-5-3-3 (8)							
		Gray Silty Fine SAND (SM)	SS 2		3-2-1-1 (3)							
		Gray Silty Fine SAND (SM)	SS 3		1-1-1-1 (2)							
10												
		Gray Slightly Silty Fine SAND (SP-SM)	SS 4		4-5-5 (10)							
15												
		Brown/Gray Silty Fine SAND with Trace of Wood (SM)	SS 5		3-4-4 (8)							
20												
		Gray Slightly Silty Fine SAND (SP-SM)	SS 6		5-8-9 (17)							
25												
			SS 7		3-2-2 (4)							
30		Boring Termination Depth at 30.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER 2022.GPJ GINT STD US LAB.GDT 6/2/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER B-4

CLIENT CCR Architecture & Interiors
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M122-120-556
PROJECT LOCATION Panama City, Florida
DATE STARTED 5/12/22 **COMPLETED** 5/12/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Standard Penetration Test (SPT)
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 7.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Tan Slightly Silty Fine SAND (SP-SM)	AU									
		Brown Slightly Silty Fine SAND (SP-SM)										
5		Gray/Brown Slightly Silty Fine SAND (SP-SM)	SS 1		4-5-7-8 (12)							
		▽ Gray Silty Fine SAND (SM)	SS 2		4-3-3-3 (6)							
10		Gray Slightly Silty Fine SAND (SP-SM)	SS 3		3-4-6-7 (10)							
15		Dark Gray Slightly Silty Fine SAND with Trace of Wood (SP-SM)	SS 4		6-4-4 (8)							
20		Gray Silty Fine SAND with Trace of Wood (SM)	SS 5		5-5-6 (11)							
25		Gray Silty Fine SAND (SM)	SS 6		7-6-6 (12)							
30		Dark Gray Slightly Silty Fine SAND (SP-SM)	SS 7		2-3-2 (5)							
		Boring Termination Depth at 30.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER 2022.GPJ GINT STD US LAB.GDT 6/2/22

Magnum Engineering, Inc.
1026 Pierson Drive
Lynn Haven, Florida 32444
Telephone: 8502658332

BORING NUMBER B-5

CLIENT CCR Architecture & Interiors
PROJECT NAME MLK Recreation Center
PROJECT NUMBER M122-120-556
PROJECT LOCATION Panama City, Florida
DATE STARTED 5/12/22 **COMPLETED** 5/12/22
GROUND ELEVATION _____ **HOLE SIZE** _____
DRILLING CONTRACTOR GeoDrill Tech, LLC
GROUND WATER LEVELS:
DRILLING METHOD Standard Penetration Test (SPT)
▽ **DEPTH TO GROUNDWATER AT TIME OF DRILLING** 7.0 ft
LOGGED BY J. Governale **CHECKED BY** J. Vickers
ESTIMATED SEASONAL HIGH GWT ---
NOTES _____
AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		Asphalt Pavement (1 1/4" Thick)										
		Orange Clayey Fine SAND (Base) (6" Thick) (SC)										
		Tan Slightly Silty Fine SAND (SP-SM)	AU									
5			SS 1		4-6-7-7 (13)							
		Gray/Brown Silty Fine SAND (SM) ▽	SS 2		3-1-2-1 (3)							
		Gray/Brown Slightly Silty Fine SAND (SP-SM)	SS 3		1-1-1-1 (2)							
10												
		Gray Slightly Silty Fine SAND (SP-SM)	SS 4		7-8-8 (16)							
15												
		Dark Gray Slightly Silty Fine SAND with Wood (SP-SM)	SS 5		5-6-7 (13)							
20												
		Gray Slightly Silty Fine SAND (SP-SM)	SS 6		4-5-7 (12)							
25												
		Gray Slightly Silty Fine SAND (SP-SM)	SS 7		5-5-4 (9)							
30		Boring Termination Depth at 30.0 feet.										

GEOTECH BH COLUMNS MLK RECREATION CENTER 2022.GPJ GINT STD US LAB.GDT 6/2/22

DOCUMENT 00 31 43 - PERMIT APPLICATION

1.1 PERMIT APPLICATION INFORMATION

A. This Document is part of the Procurement and Contracting Requirements for this Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.

B. Permit Application: Complete building permit application and file with authorities having jurisdiction within five days of the Notice to Proceed. Building plans for this project were submitted by the PMO at the 90% complete stage (City Development Order for site & EPCI for building review). Review comments were returned to the A/E. Contractor will resubmit for final approval / permit.

C. Site Permits:

END OF DOCUMENT 00 31 43

DOCUMENT **00 41 13** - **BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)**

BID INFORMATION

Bidder: _____

Project Name: Martin Luther King Jr. Recreation Center
Project Location: 705 14th Court East, Panama City, Florida 32401

Owner: City of Panama City, FL

Architect: CCR Architecture & Interiors

Architect Project Number: 21109

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

$ _____ Dollars

Total stipulated sum is non-federally funded and federally funded totals combined. The above amount may be modified by the Owner in the amount indicated by the Bidder for alternates and building alternates.

General conditions may not exceed 4.25% of the stipulated sum.

General requirements may not exceed 13% of the stipulated sum.

Stipulated sum is a combination of Federally and Non-Federally funded work as outlined in the specifications and drawings associated with this project. Any work not included should be added with a detailed description in the other section of each applicable bid schedule.

Upon receipt of the Notice of Intent to Award and prior to the Owner/Contractor agreement, the City may require the selected contractor to provide a quantitative breakdown of any bid form line-item that moderately deviates from the Architect’s bid form line-item cost estimate.

NON-FEDERALLY FUNDED PRICE BREAKDOWN

See sheet C-4 for non-federally funded boundary. Non-federally funded work includes everything outside of the **red** boundary line unless otherwise specified below:

DIVISION OR SHEET	DESCRIPTION	BID AMOUNT
00	General Conditions for Non-Federally Funded Work	$
01	General Requirements for Non-Federally Funded Work	$
02	Site Work - Excludes Federally Funded Site Work	$
26	Site Electrical	$
32	32 13 13 - Concrete Paving - Parking Lot	$
32	32 13 13 - Concrete Paving - Sidewalks	$
32	32 13 13 - Concrete Paving – All Other	$
32	32 14 16 - Unit Pavers	$
32	32 18 17 - Poured-In-Place Rubber Surfacing	$
32	32 18 16 - Play Equipment	$
L2-1	Play Tower (A1)	$
L2-1	Play Tower (B1)	$
L2-1	Metallophone	$
L2-1	Kundu Drum	$
L2-1	Double Arch Swing	$
32	32 31 16 - Ornamental Welded Wire Fence	$
32	32 80 00 - Irrigation	$
32	32 90 00 - Landscaping	$

32	32 91 10 - Landscape Maintenance	$
32	Exterior Improvements – All Other	$
L2.0	Site Furnishings	$
L2-0	Bleachers (two)	$
L2-0	Bench(s)	$
L2-0	Trash Receptacle(s)	$
L2-0	Picnic Table(s)	$
L2-0	Bike Rack(s)	$
L2-0	Ornamental Stone	$
L2.2	Multi-Purpose Field - Include Lighting	$
L2.3	Pavilion @ Open Field	$
L2.3	Pavilion @ Playground	$
Other	Allowance: Outdoor Statue/Sculpture	$ 30,000
Other	Allowance: Commissioning of Outdoor Statue/Sculpture	
Other	Allowance: Monument Sign (3)	$ 80,000
Other	Allowance: Communications 27 80 00 Only	$ 66,000
Other	Allowance: Electronic Safety and Security 28 10 00 Only	$ 22,000
Other	Allowance: IT Networking Equipment	$ 80,000
Other	Allowance: Building Permit	$150,000
Other	Allowance: Florida Power and Light Fees	$ 5,000
Other	Allowance: HVAC Controls 23 09 93 Only	$ 181,050
Other	Allowance: Recreational Sports Gear (balls, netting, field painting equipment, etc)	$ 5,000
Other	Allowance: Stem Lab Equipment	$ 200,000
Other	Allowance: Engineering & Sound Booth Equipment	$ 50,000
Other	Allowance: Teaching Kitchen Tableware/Kitchenware	$ 7,500
Other	Allowance: Fitness Room Equipment	$ 10,000

Other		$
Other		$
Other		$
	TOTAL NON-FEDERALLY FUNDED Total stipulated sum of non-federally funded and federally funded totals combined	$

ALTERNATES | SUBSTITUTIONS TO NON-FEDERALLY FUNDED WORK

The City may elect to substitute or modify the above base bid scope of work with the following alternates. Bidders are required to provide costs for all alternates listed below. Costs below should not be reflected in the total stipulated sum above.

ALTERNATE/SUBSTITUTION		ADD/(DEDUCT)
#1	**DELETE:** Poured in place rubber surfacing, play equipment, ornamental welded wire fence, sidewalk, furnishings around playground, one pavilion, picnic tables, and trash receptacle **REPLACE:** Entire area with sod	$
#2	**DELETE:** Outdoor multipurpose field, bleachers/slabs, & field lights **REPLACE:** Entire area with sod	$
#3	**DELETE:** Ornamental stone **REPLACE:** Entire area with concrete	$
#4	**DELETE:** Ornamental welded wire fence **REPLACE:** Vinyl coated chain link fencing	$
#5	**MODIFY:** Reduce allowance for monument signs (3)	$ 40,000

ALTERNATES | REMOVAL OF NON-FEDERALLY FUNDED WORK

The City may elect to remove the following alternates from the above scope of work. Bidders are required to provide costs for all alternates listed below. Costs below should not be reflected in the total stipulated sum above.

ALTERNATE/DELETE		(ADD)/DEDUCT
#6	**DELETE:** Outdoor statue/sculpture	$ 30,000
#7	**DELETE:** Pavilion @ open field, picnic table(s), & trash receptacle(s)	$
#8	**DELETE:** Landscape, Landscape Maintenance, & Irrigation	$

#9	**DELETE:** Pavilion @ Open Field	$
#10	**DELETE:** Pavilion @ Playground	$
#11	**DELETE:** Concrete Paving – Parking Lot including Bumpers & Striping	$

FEDERALLY FUNDED PRICE BREAKDOWN

See sheet C-4 for federally funded boundary line. Federally funded work includes everything inside of the **red** boundary line.

DIVISION OR SHEET	DESCRIPTION	BID AMOUNT
00	General Conditions for Federally Funded Work	$
01	General Requirements Federally Funded	$
02	Site Work - Excludes Non-Federally Funded Site Work	$
03	03 15 10 - Rammed Aggregate Pier Foundation System	$
L2-2	Memorial Wall	$
03	Concrete – All Other	$
04	Masonry	$
05	Metals – All Other	$
05	05 52 00 - Aluminum Handrails and Railings	$
06	Wood and Plastics	$
07	Thermal and Moisture Protection	$
08	Openings	$
09	Finishes	$

09	09 64 60 Vinyl sheet flooring (Gymnasium) (A1)	$
09	09 64 60 Recycled tire rubber flooring (Fitness Room) (A2)	$
10	10 26 22 Operable Panel Partition	$
10	10 53 00 Aluminum Canopies	$
10	Specialties – All Other	$
11	11 40 00 - Food Service Equipment	$
11	11 48 00 - Overhead-supported basketball backstops (12)	$
11	11 48 00 - Volleyball Equipment	$
11	11 48 00 - Gymnasium Equipment – All Other	$
11	Equipment – All Other	$
A302	Appliances – See Legend	$
12	12 50 00 - Furniture Package	$
13	Pre- Engineered Metal Building	$
21	Fire Protection	$
22	Plumbing	$
23	HVAC – All Sections Except 23 09 93	$
26	26 41 13 - Lighting Protection	$
26	Electrical – All Other	$

27	Communications – Structured Cabling 27 00 00 Only	$
28	28 46 21.11 Addressable Fire Alarm Systems	$
32	32 13 13 - Concrete Paving - Sidewalks	$
	32 13 13 - Concrete Paving – All Other	$
	32 14 16 - Unit Pavers	$
	32 18 17.1 - Court Markings	$
	32 31 13 - Vinyl Coated Chain Link Fencing	$
	32 33 00 - Site Furnishings	$
	32 33 00 - Site Furnishings - Modular Dance Floor F1	$
32	Exterior Improvements – All Other	$
L2.0	Site Furnishings	$
L2-2	Park Sign	$
L2-3	Pavilion @ Play Court	$
Other	Allowance: Changes and Additions by the A&E and the City	$ 100,000
Other	Allowance: Building and Site Electrical Permit	$ 2,500
Other	Allowance: Art Wall Covering	$ 12,000
Other	Allowance: Gymnasium Acoustical Panels	$ 65,000
Other	Allowance: Visual Display Equipment	$ 50,000
Other	Allowance: Interior Signage	$ 11,000
Other	Allowance: PA Speaker System	$ 110,000
Other	Allowance: Memorial Wall Engraved Plaques	$
Other		$
Other		$
Other		$
Other		$

	TOTAL FEDERALLY FUNDED Total stipulated sum of non-federally funded and federally funded totals combined	$

ALTERNATES | SUBSTITUTIONS TO FEDERALLY FUNDED WORK

The City may elect to substitute or modify the above base bid scope of work with the following alternates. Bidders are required to provide costs for all alternates listed below. Costs below should not be reflected in the total stipulated sum above.

ALTERNATE/SUBSTITUTE		ADD/(DEDUCT)
#12	**DELETE:** Permeable Pavers (3 L2-2). **REPLACE:** Concrete Paving	$
#13	**DELETE:** 8 Overhead-supported basketball backstops, including associated structural beams and electrical 11 48 00. **REPLACE:** 8 portable roll – out backstops equivalent to Porter manual 735.	$
#14	**DELETE:** Outdoor Basketball Court, Pavilion @ Play court, Play court, fencing, sports lighting, adjacent furnishings, and backstops. **REPLACE**: Concrete.	$
#15	**DELETE:** Lightning protection system shown on E-701. **REPLACE:** CMCE lightning protection system.	$
#16	**MODIFY:** Reduce Allowance Changes and Additions by the A&E and the City	$ 50,000

ALTERNATES | REMOVAL OF FEDERALLY FUNDED WORK

The City may elect to remove the following alternates from the above scope of work. Bidders are required to provide costs for all alternates listed below. Costs below should not be reflected in the total stipulated sum above.

ALTERNATE/DELETE		(ADD)/DEDUCT
#17	**DELETE:** Art Wall Covering	$ 12,000
#18	**DELETE:** Gymnasium Acoustical Panels	$ 65,000
#19	**DELETE:** Visual Display Equipment	$ 50,000
#20	**DELETE:** Memorial Wall Engraved Plaques	$ 9,000

#21	**DELETE:** Modular Dance Floor (F1)	$
#22	**DELETE:** Food Service Equipment	$
#23	**DELETE:** Operable Panel Partition	$
#24	**DELETE:** Furniture Package	$
#25	**DELETE:** Vibration and Seismic Controls in applicable Divisions. (Federally and Non-Federally Funded)	$

Assumptions, Qualification, and Clarifications – Bidder shall provide a list of assumptions, qualifications, and clarifications that have been made in this bid.
Owner Direct Purchase - Bidder shall provide a list of proposed owner direct purchase items. Identify long lead items that will need to be addressed early in the construction process.
Bidders to Bid on Alternates and Mitigation Alternates.

Bidders are required to provide costing for the following building alternates as outlined in the drawings and specifications.

MITIGATION ALTERNATES			
Building Element	160 MPH Wind Speed Case **Base Bid**	140 MPH Wind Speed Case **Alternate**	Difference
Steel Structure	$_____ See Sheet S2.13	$_____ See Sheet S2.13 ALT	$_____
Roof Structure	$_____ See Sheet A101	$_____ See Sheet A101 ALT	$_____
Outside Walls	$_____ See Sheet S1.0	$_____ See Sheet S1.0	$_____
Windows	$_____ Impact Rated See Sheet A101 & A902	$_____ Non-impact rated See Sheet A101 ALT & A902 ALT	$_____

BID GUARANTEE

The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 15 days after a written Notice of Intent to Award, if offered within 60 days after receipt of bids, and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting the greater of five percent (5%) of the stipulated sum above, or $10,000:

$_____Dollars

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

SUBCONTRACTORS, SUPPLIERS, AND MANUFACTURERS LIST

Bidders must submit a comprehensive list of all subcontracts or purchase orders for all portions of the work to be completed on form AIA G705. Architect should verify listed subcontractors' qualifications prior to issuing the Notice of Award.

TIME OF COMPLETION

Coordinate location of Contract Time requirement with option in paragraph below. The undersigned Bidder proposes and agrees hereby to commence the work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Owner and shall fully complete the work within 450 calendar days.

ACKNOWLEDGEMENT OF ADDENDA

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

Addendum No. 1, dated _____.

Addendum No. 2, dated _____.

Addendum No. 3, dated _____.

Addendum No. 4, dated _____.

Addendum No. 5, dated _____.

BID SUPPLEMENTS

The following supplements are a part of this Bid Form and are attached hereto. Revise list below to suit Project. Coordinate with related Bid Form supplements.

Bid Form Supplement - Bid Bond Form (AIA Document A310-2010).
AIA G705 – List of Subcontractors.
AIA A305-2020 – Contractor's Qualifications Statement and Exhibits A-E.
CONTRACTOR'S LICENSE AND QUALIFICATIONS STATEMENT

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

The undersigned further swears and affirms that all information contained in the attached AIA form A305-2020 Contractor's Qualification Statement and all exhibits thereto are true and correct.

SUBMISSION OF BID

Respectfully submitted this ____ day of _____, 2023.

Submitted By: _____
(Name of bidding firm, corporation, or other valid entity).

Authorized Signature:_____
(Handwritten signature).

Signed By:_____
(Type or print name).

Title:_____
(Owner/Partner/President/Vice President/Manager/Managing Member)

Witnessed By:_____
(Handwritten signature).

Attest:_____
(Handwritten signature).

By:_____
(Type or print name).

Title:_____
(Corporate Secretary or Assistant Secretary).

Street Address:_____

City, State, Zip:_____

Phone:_____

License No.:_____

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

END OF DOCUMENT 00 41 13

AIA® Document G705™ – 2001

List of Subcontractors

PROJECT: *(Name and address)*

DATE:

TO ARCHITECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

FROM CONTRACTOR: *(Name and Address)*

CONTRACTOR'S PROJECT NUMBER :

(List Subcontractors and others proposed to be employed on the above Project as required by the bidding documents.)

Work/Firm Name	Address/Phone	Superintendent

AIA® Document A305™ – 2020 Exhibit A

General Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by
and dated the day of in the year
(In words, indicate day, month and year.)

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

§ A.1 ORGANIZATION
§ A.1.1 Name and Location
§ A.1.1.1 Identify the full legal name of your organization.

§ A.1.1.2 List all other names under which your organization currently does business and, for each name, identify jurisdictions in which it is registered to do business under that trade name.

§ A.1.1.3 List all prior names under which your organization has operated and, for each name, indicate the date range and jurisdiction in which it was used.

§ A.1.1.4 Identify the address of your organization's principal place of business and list all office locations out of which your organization conducts business. If your organization has multiple offices, you may attach an exhibit or refer to a website.

§ A.1.2 Legal Status
§ A.1.2.1 Identify the legal status under which your organization does business, such as sole proprietorship, partnership, corporation, limited liability corporation, joint venture, or other.

.1 If your organization is a corporation, identify the state in which it is incorporated, the date of incorporation, and its four highest-ranking corporate officers and their titles, as applicable.

.2 If your organization is a partnership, identify its partners and its date of organization.

.3 If your organization is individually owned, identify its owner and date of organization.

.4 If the form of your organization is other than those listed above, describe it and identify its individual leaders:

§ A.1.2.2 Does your organization own, in whole or in part, any other construction-related businesses? If so, identify and describe those businesses and specify percentage of ownership.

§ A.1.3 Other Information

§ A.1.3.1 How many years has your organization been in business?

§ A.1.3.2 How many full-time employees work for your organization?

§ A.1.3.3 List your North American Industry Classification System (NAICS) codes and titles. Specify which is your primary NAICS code.

§ A.1.3.4 Indicate whether your organization is certified as a governmentally recognized special business class, such as a minority business enterprise, woman business enterprise, service disabled veteran owned small business, woman owned small business, small business in a HUBZone, or a small disadvantaged business in the 8(a) Business Development Program. For each, identify the certifying authority and indicate jurisdictions to which such certification applies.

§ A.2 EXPERIENCE

§ A.2.1 Complete Exhibit D to describe up to four projects, either completed or in progress, that are representative of your organization's experience and capabilities.

§ A.2.2 State your organization's total dollar value of work currently under contract.

§ A.2.3 Of the amount stated in Section A.2.2, state the dollar value of work that remains to be completed:

§ A.2.4 State your organization's average annual dollar value of construction work performed during the last five years.

§ A.3 CAPABILITIES

§ A.3.1 List the categories of work that your organization typically self-performs.

§ A.3.2 Identify qualities, accreditations, services, skills, or personnel that you believe differentiate your organization from others.

§ A.3.3 Does your organization provide design collaboration or pre-construction services? If so, describe those services.

§ A.3.4 Does your organization use building information modeling (BIM)? If so, describe how your organization uses BIM and identify BIM software that your organization regularly uses.

§ A.3.5 Does your organization use a project management information system? If so, identify that system.

§ A.4 REFERENCES

§ A.4.1 Identify three client references:
(Insert name, organization, and contact information)

§ A.4.2 Identify three architect references:
(Insert name, organization, and contact information)

§ A.4.3 Identify one bank reference:
(Insert name, organization, and contact information)

§ A.4.4 Identify three subcontractor or other trade references:
(Insert name, organization, and contact information)

AIA® Document A305™ – 2020 Exhibit B

Financial and Performance Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by
and dated the day of in the year
(In words, indicate day, month and year.)

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

§ B.1 FINANCIAL

§ B.1.1 Federal tax identification number:

§ B.1.2 Attach financial statements for the last three years prepared in accordance with Generally Accepted Accounting Principles, including your organization's latest balance sheet and income statement. Also, indicate the name and contact information of the firm that prepared each financial statement.

§ B.1.3 Has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, been the subject of any bankruptcy proceeding within the last ten years?

§ B.1.4 Identify your organization's preferred credit rating agency and identification information.
(Identify rating agency, such as Dun and Bradstreet or Equifax, and insert your organization's identification number or other method of searching your organization's credit rating with such agency.)

§ B.2 DISPUTES AND DISCIPLINARY ACTIONS

§ B.2.1 Are there any pending or outstanding judgments, arbitration proceedings, bond claims, or lawsuits against your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A, Section 1.2, in which the amount in dispute is more than $75,000?
(If the answer is yes, provide an explanation.)

§ B.2.2 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 failed to complete work awarded to it?

.2 been terminated for any reason except for an owners' convenience?

.3 had any judgments, settlements, or awards pertaining to a construction project in which your organization was responsible for more than $75,000?

.4 filed any lawsuits or requested arbitration regarding a construction project?

§ B.2.3 In the last five years, has your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management; or any of the individuals listed in Exhibit A Section 1.2:
(If the answer to any of the questions below is yes, provide an explanation.)

.1 been convicted of, or indicted for, a business-related crime?

.2 had any business or professional license subjected to disciplinary action?

.3 been penalized or fined by a state or federal environmental agency?

AIA® Document A305™ – 2020 Exhibit C

Project Specific Information

This Exhibit is part of the Contractor's Qualification Statement, submitted by
and dated the day of in the year
(In words, indicate day, month and year.)

PROJECT:
(Name and location or address.)

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

CONTRACTOR'S PROJECT OFFICE:
(Identify the office out of which the contractor proposes to perform the work for the Project.)

TYPE OF WORK SOUGHT
(Indicate the type of work you are seeking for this Project, such as general contracting, construction manager as constructor, design-build, HVAC subcontracting, electrical subcontracting, plumbing subcontracting, etc.)

CONFLICT OF INTEREST
Describe any conflict of interest your organization, its parent, or a subsidiary, affiliate, or other entity having common ownership or management, or any of the individuals listed in Exhibit A Section 1.2, may have regarding this Project.

§ C.1 PERFORMANCE OF THE WORK
§ C.1.1 When was the Contractor's Project Office established?

§ C.1.2 How many full-time field and office staff are respectively employed at the Contractor's Project Office?

§ C.1.3 List the business license and contractor license or registration numbers for the Contractor's Project Office that pertain to the Project.

§ C.1.4 Identify key personnel from your organization who will be meaningfully involved with work on this Project and indicate (1) their position on the Project team, (2) their office location, (3) their expertise and experience, and (4) projects similar to the Project on which they have worked.

§ C.1.5 Identify portions of work that you intend to self-perform on this Project.

§ C.1.6 To the extent known, list the subcontractors you intend to use for major portions of work on the Project.

§ C.2 EXPERIENCE RELATED TO THE PROJECT

§ C.2.1 Complete Exhibit D to describe up to four projects performed by the Contractor's Project Office, either completed or in progress, that are relevant to this Project, such as projects in a similar geographic area or of similar project type. If you have already completed Exhibit D, but want to provide further examples of projects that are relevant to this Project, you may complete Exhibit E.

§ C.2.2 State the total dollar value of work currently under contract at the Contractor's Project Office:

§ C.2.3 Of the amount stated in Section C.2.2, state the dollar value of work that remains to be completed:

§ C.2.4 State the average annual dollar value of construction work performed by the Contractor's Project Office during the last five years.

§ C.2.5 List the total number of projects the Contractor's Project Office has completed in the last five years and state the dollar value of the largest contract the Contractor's Project Office has completed during that time.

§ C.3 SAFETY PROGRAM AND RECORD

§ C.3.1 Does the Contractor's Project Office have a written safety program?

§ C.3.2 List all safety-related citations and penalties the Contractor's Project Office has received in the last three years.

§ C.3.3 Attach the Contractor's Project Office's OSHA 300a Summary of Work-Related Injuries and Illnesses form for the last three years.

§ C.3.4 Attach a copy of your insurance agent's verification letter for your organization's current workers' compensation experience modification rate and rates for the last three years.

§ C.4 INSURANCE

§ C.4.1 Attach current certificates of insurance for your commercial general liability policy, umbrella insurance policy, and professional liability insurance policy, if any. Identify deductibles or self-insured retentions for your commercial general liability policy.

§ C.4.2 If requested, will your organization be able to provide property insurance for the Project 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?

§ C.4.3 Does your commercial general liability policy contain any exclusions or restrictions of coverage that are prohibited in AIA Document A101-2017, Exhibit A, Insurance A.3.2.2.2? If so, identify.

§ C.5 SURETY

§ C.5.1 If requested, will your organization be able to provide a performance and payment bond for this Project?

§ C.5.2 Surety company name:

§ C.5.3 Surety agent name and contact information:

§ C.5.4 Total bonding capacity:

§ C.5.5 Available bonding capacity as of the date of this qualification statement:

AIA® Document A305™ – 2020 Exhibit D

Contractor's Past Project Experience

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

Init.

AIA® Document A305™ – 2020 Exhibit E

Contractor's Past Project Experience, Continued

	1	2	3	4
PROJECT NAME				
PROJECT LOCATION				
PROJECT TYPE				
OWNER				
ARCHITECT				
CONTRACTOR'S PROJECT EXECUTIVE				
KEY PERSONNEL (include titles)				
PROJECT DETAILS	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work	Contract Amount Completion Date % Self-Performed Work
PROJECT DELIVERY METHOD	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:	☐ Design-bid-build ☐ Design-build ☐ CM constructor ☐ CM advisor ☐ Other:
SUSTAINABILITY CERTIFICATIONS				

Init.

/

DOCUMENT 00 43 13 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A310-2010 "Bid Bond" is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; https://www.aiacontracts.org/; email: docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT 00 43 13

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)

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.

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

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

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

Signed and sealed this day of

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

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

Init.
/

SECTION 00 43 21 – ALLOWANCE FORM

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 administrative and procedural requirements governing allowances.

1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Modification Procedures" specifies procedures for submitting and handling Change Orders.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At the Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by the Architect from the designated supplier.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly upon delivery for damage or defects.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. See Bid Form 00 41 13.

END OF SECTION 00 43 21

DOCUMENT **00 43 23** - **ALTERNATES FORM**

1.1 BID INFORMATION

A. Project Name: Martin Luther King Jr. Recreation Center
B. Project Location: 705 14th Court East, Panama City, Florida 32401
C. Owner: City of Panama City, FL
D. Architect: CCR Architecture & Interiors
E. Architect Project Number: 21109

1.2 DESCRIPTION

A. The Bidder proposes the amount on the bid form to be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.
B. If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."
C. If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."
D. The Bidder shall be responsible for determining from the Contract Documents the effects of each alternate on the Contract Time and the Contract Sum.
E. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within 90 days of the Notice of Intent to Award unless otherwise indicated in the Contract Documents.
F. Acceptance or non-acceptance of any alternates by the Owner shall have no effect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

1.3 SCHEDULE OF ALTERNATES

A. See Bid Form 00 41 13.

DOCUMENT 00 43 73 - PROPOSED SCHEDULE OF VALUES FORM

1.1 BID FORM SUPPLEMENT

A. A completed proposed Schedule of Values form is required to be submitted for review within **fifteen** (15) days after the Notice of Intent to Award.

B. Bidder is required to provide separate and detailed Schedule of Values for the following:
   1. Federally Funded Scope of Work to include – see construction documents sheet C-4 for Federally Funded Scope of Work boundary (excluding Landscape/Irrigation)
   2. Non-Federally Funded Scope of Work.

C. The Schedule of Values detail must be agreed upon by all parties as part of the signed contract before construction begins.

D. Proposed Schedule of Values Form: Provide a detailed breakdown of the bid amount, including alternates and allowances in enough detail to facilitate continued evaluation of bid. Owner may require quantities or labor and material breakdown for some line items, owner will request if needed. Coordinate with the Project Manual table of contents. Provide multiple line items for principal material and subcontract amounts more than **two** (2) percent of the Contract Sum. The intent is for the Scheduled of Values to form the basis for Payment Applications.

E. Provide a separate line item for General Conditions and General Requirements. General Conditions are commonly known as “The cost to manage the project”. General Conditions should not exceed a total of 4.25% of the contract value. General Requirements are commonly known as “The non-management indirect cost of executing the project”. General Requirements should not exceed a total of 13% of the contract value.

F. Arrange schedule of values using AIA Document G703-1992.
   1. Copies of AIA standard forms may be obtained from the American Institute of Architects; https://www.aiacontracts.org/ library; (800) 942-7732.

END OF DOCUMENT 00 43 73

DOCUMENT 00 43 93 - BID SUBMITTAL CHECKLIST

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Martin Luther King Jr. Recreation Center

C. Project Location: 705 14th Court East, Panama City, Florida 32401

D. Owner: City of Panama City, FL

E. Architect: CCR Architecture & Interiors

F. Architect Project Number: 21109

1.2 BIDDER'S CHECKLIST

A. In an effort to assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements.

1. Used the Bid Form provided in the Project Manual.
2. Prepared the Bid Form as required by the Instructions to Bidders.
3. Indicated on the Bid Form the Addenda received.
4. Attached to the Bid Form: Bid Bond OR submitted a certified check for the amount required.
5. Attached to the Bid Form: AIA A305 - 2020 with exhibits A-E- Contractor’s Qualifications.
6. Attached to the Bid Form: AIA G705 – List of Subcontractors.
7. Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
8. Verified that the Bidder can provide Certificates of Insurance in the amounts indicated.

END OF DOCUMENT 00 43 93

DOCUMENT 00 45 49 – CERTIFICATION REGARDING DEBARMENTS

CERTIFICATION REGARDING DEBARMENTS, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION-LOWER TIER FEDERALLY FUNDED TRANSACTIONS

1. The undersigned hereby certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

2. The undersigned also certifies that it and its principals:

   (a) Have not within a three-year period preceding this certification 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) transaction or contract under a public transaction; violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

   (b) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph 2. (a) of this Certification; and

   (c) Have not within a three-year period preceding this certification had one or more public transactions (Federal, State or local) terminated for cause or default.

3. Where the undersigned is unable to certify to any of the statements in this certification, an explanation shall be attached to this certification.

Dated this _____day of _____, 20___

By_____
(Signature on file)

_____
Recipient's Firm Name

_____
Street Address

_____
Building, Suite Number

_____
City/State/Zip Code

_____Area Code/Telephone Number

CERTIFICATION REGARDING DEBARMENTS, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION-LOWER TIER FEDERALLY FUNDED TRANSACTIONS

INSTRUCTIONS FOR CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION-LOWER TIER FEDERALLY FUNDED TRANSACTIONS

1. By signing and submitting this form, the certifying party is providing the certification set out below.

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the certifying party knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government or agencies with which this transaction originated may pursue available remedies, including suspension and/or debarment.

3. The certifying party shall provide immediate written notice to the person to whom this contract is submitted if at any time the certifying party learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used in this clause, have the meanings set out in the Definitions and Coverage sections of rules implementing Executive Order 12549. You may contact the person to which this contract is submitted for assistance in obtaining a copy of those regulations.

5. The certifying party agrees by submitting this contract that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier contract, or other covered transaction with a person who is proposed for debarment under 48 CFR 9, subpart 9.4, debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the Commission or agency with which this transaction originated.

6. The certifying party further agrees by executing this contract that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all contracts or lower tier covered transactions and in all solicitations for lower tier covered transactions.

7. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not is proposed for debarment under 48 CFR 9, subpart 9.4, debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the Non-procurement List (Telephone No. (202) 501-4740 or (202) 501-4873).

8. 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 this clause. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

9. Except for transaction s authorized under paragraph 5 of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is proposed for debarment under 48 CFR 9, subpart 9.4, suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the Commission or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

DOCUMENT 00 45 81 – TRENCH SAFETY ACT

CERTIFICATE OF COMPLIANCE WITH THE FLORIDA TRENCH SAFETY ACT

Bidder acknowledges sole responsibility for complying with the Florida Trench Safety Act (Act) and Occupational Safety and Health Administration's excavation safety standard 29 CFR 1926.650 (Subpart P as amended). Bidder further acknowledges that included in the various items of the proposal and in the Grand Total Base Bid Price are costs for complying with the Florida Trench Safety Act (90-96, Laws of Florida) effective October 1, 1990. The bidder further identifies the costs to be summarized below:

	Trench Safety Method (Description)	Units of Measure (LF, SY)	Unit (Quantity)	Unit Cost	Extended Cost
A.					
B.					
C.					
D.					

Total: $_____

Failure to complete the above may result in the bid being declared non-responsive. The costs indicated above are provided to comply with the Act and shall not constitute grounds for any additional compensation to that listed for the separate line items of the Bid Form.

By: _____

Bidder: _____

Date: _____

_____
Authorized Signature

END OF SECTION

DOCUMENT 00 45 83 – PUBLIC ENTITY CRIMES AFFIDAVIT

SWORN STATEMENT UNDER SECTION 287.133 (3) (A), FLORIDA STATUTES, ON PUBLIC ENTITY CRIMES. THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement is submitted to the CITY OF PANAMA CITY by

_____

(Print individual's name and title)

for

_____

(Print name of entity submitting sworn statement) whose business address is

and (if applicable) its Federal Employer Identification Number (FEIN) is

_____

If the entity has no FEIN, include the Social Security Number of the individual signing this Sworn Statement:

_____

2. I understand that a "public entity crime" as defined in Paragraph 287.133(1)(g), Florida Statutes, means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including, but not limited to any bid or contract for goods or services to be provided to any public entity or an agency or political subdivision or any other state or of the United States and involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

3. I understand that "convicted" or "conviction" as defined in Paragraph 287.133(1) (b), Florida Statutes, means a finding of guilt of a conviction of a public entity crime, with or without an adjudication of guilt, in any federal or state trial court of record relating to charges brought by indictment or information after July 1, 1989, as a result of a jury verdict, non-jury trial, or entry of a plea of guilty or nolo contendre.

4. I understand that an "affiliate" as defined in Paragraph 287.133(1) (a), Florida Statutes, means:
   1. A predecessor or successor of a person convicted of a public entity crime; or
   2. An entity under the control of any natural person who is active in the management of the entity and who has been convicted of a public entity crime. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of an affiliate. The ownership by one person of shares constituting a controlling interest in another person, or a pooling of equipment or income among persons when not for fair market value under an arm's length agreement, shall be a prima facie case that one person controls another person. A person who knowingly enters into a joint venture with a person who has been convicted of public entity crime.

5. I understand that a "person" as defined in Paragraph 287.133(1) (e), Florida Statutes, means any natural person or entity organized under the laws of any state or of the United States with legal power to enter into a binding contract and which bids or appeals to bid on contracts for the provision of goods and services let by a public entity, or which otherwise transacts or applies to transact business with a public entity. The term "person" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in management of an entity.
6. Based on information and belief, the statement, which I have marked below, is true in relation to the entity submitting this sworn statement. (Indicate which statement applies.)

_____ Neither the entity submitting this sworn statement, nor one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, nor any affiliate of the entity have been charged with and convicted of a public entity crime subsequent to July 1, 1989.

_____ The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989.

_____ The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity or an affiliate of the entity has been charged with and convicted of a public entity crime subsequent to July 1, 1989. However, there has been a subsequent proceeding before a Hearing Officer of the State of Florida, Division of Administrative Hearings and the Final Order entered by the Hearing Officers determined that it was not in the public interest to place the entity submitting this sworn statement on the convicted vendor list (ATTACH A COPY OF THE FINAL ORDER).

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR THE PUBLIC ENTITY IDENTIFIED IN PARAGRAPH 1 (ONE) ABOVE IS FOR THAT PUBLIC ENTITY ONLY AND THAT THIS FORM IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT I AM REQUIRED TO INFORM THE PUBLIC ENTITY PRIOR TO ENTERING INTO A CONTRACT IN EXCESS OF THE THRESHOLD AMOUNT PROVIDED IN SECTION 287.017, FLORIDA STATUTES FOR A CATEGORY TWO OR ANY CHANGE IN THE INFORMATION CONTAINED IN THIS FORM.

(Signature)

Sworn to and subscribed before me this _____day of _____

20___

Personally known _____

Or produced identification _____

Notary Public-State of_____

My commission expires_____

_____

(Printed, typed, or stamped commissioned name of notary public.)

DOCUMENT 00 45 85 – DRUG FREE WORKPLACE PROGRAMS

STATEMENT UNDER SECTION 287.087 FLORIDA STATUTES, ON PREFERENCE TO BUSINESSES WITH DRUG-FREE WORKPLACE PROGRAMS

IDENTICAL TIE BIDS:
Preference shall be given to businesses with drug-free workplace programs. Whenever two or more bids which are equal with respect to price, quality and service are received by the State or by any political subdivision for the procurement of commodities or contractual services, a bid received by the State or by any political subdivision for the procurement of commodities or contractual services, a bid received from a business that certifies that it has implemented a drug-free workplace program shall be given preference in the award process.

Established procedures for processing tie bids will be followed if none of the tied vendors have a drug-free workplace program. In order to have a drug-free workplace program, a business shall:

1. Publish a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the workplace and specifying the actions that will be taken against employees for violations of such prohibition.

2. Inform employees about the dangers of drug abuse in the workplace, the business' policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

3. Give each employee engaged in providing the commodities or contractual services that are under bid a copy of the statement specified in subsection (1).

4. In the statement specified in subsection (1), notify the employees that, as a condition of working on the commodities or contractual services that are under bid, the employee will abide by the terms of the statement and will notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of Chapter 893 or of any controlled substance law of the United States or any state, for a violation occurring in the workplace not later than five (5) days after such conviction.

5. Impose a sanction on, or require the satisfactory participation in a drug abuse assistance or rehabilitation program is such is available in the employee's community, by an employee who is so convicted.

6. Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

BIDDER SIGNATURE

NAME:_____

DATE: _____

END OF SECTION

DOCUMENT 00 45 87 – ANTI-COLLUSION STATEMENT

I hereby attest that I am the person responsible within my company for the final decision as to the price(s) and amount of this bid or, if not, that I have written authorization, enclosed herewith, from that person to make the statements set out below on his or her behalf and on behalf of my company.

I further attest that:

1. The price(s) and amount of this bid have been arrived at independently, without consultation, communication or agreement for the purpose or with the effect of restricting competition with any other company or person who is a bidder or potential prime bidder.

2. Neither the price(s) nor the amount of this bid have been disclosed to any other company or person who is a bidder or potential prime bidder on this project, and will not be so disclosed prior to bid opening.

3. Neither the prices nor the amount of the bid of any other company or person who is a bidder or potential prime bidder on this project have been disclosed to me or my company.

4. No attempt has been made to solicit, cause or induce any company or person who is a bidder or potential prime bidder to refrain from bidding on this project, or to submit a bid higher than the bid of this company, or any intentionally high or noncompetitive bid or other form of complementary bid.

5. No agreement has been promised or solicited for any other company or person who is a bidder or potential prime bidder on this project to submit an intentionally high, noncompetitive or other form of complementary bid on this project.

6. The bid of my company is made in good faith and not pursuant to any consultation, communication, agreement or discussion with, or inducement or solicitation by or from any company or person to submit any intentionally high, noncompetitive or other form of complementary bid.

7. My company has not offered or entered into a subcontract or agreement regarding the purchase or sale of materials or services from any company or person, or offered, promised or paid cash or anything of value to any company or person, whether in connection with this or any other project, in consideration for an agreement or promise by any company or person to refrain from bidding or to submit any intentionally high, noncompetitive or other form of complementary bid or agreeing or promising to do so on this project.

8. My company has not accepted or been promised any subcontract or agreement regarding the sale of materials or services to any company or person, and has not been promised or paid cash or anything of value by any company or person, whether in connection with this or any other project, in consideration for my company's submitting any intentionally high, noncompetitive or other form of complementary bid, or agreeing or promising to do so, on this project.

9. I have made a diligent inquiry of all members, officers, employees, and agents of my company with responsibilities relating to the preparation, approval or submission of my company's bid on this project and have been advised by each of them that he or she has not participated in any communication, consultation, discussion, agreement, collusion, or other conduct inconsistent with any of the statements and representations made in this affidavit.

10. I understand and my company understands that any misstatement in this affidavit is and shall be treated as a fraudulent concealment from the City of Panama City, of the true facts relating to submission of bids for this contract.

I DECLARE UNDER PENALTY OF PERJURY IN THE SECOND DEGREE, AND ANY OTHER APPLICABLE STATE OR FEDERAL LAWS, THAT THE STATEMENTS MADE ON THIS DOCUMENT ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

Signature	Company Name
Title	Address
Date	Phone Number

END OF SECTION

DOCUMENT 00 45 89 – CONFLICT OF INTEREST DISCLOSURE FORM

Please mark which of the following applies to you/your company:

_____ I hereby attest that no City of Panama City Commissioner(s), employee(s), elected officials(s), of if any of its agencies is also an owner, corporate officer, agency, employee, etc., of their corporation/partnership/individual business.

_____ The following person(s) name(s) and position(s) with your business.

NAME(S) POSITION(S)

_____

_____

_____

_____

_____

(Signature)

Title / Date: _____

Business Name: _____

END OF SECTION

NOTICE OF AWARD

Date of Issuance:		
Owner:	City of Panama City	Owner's Project No.:
Architect/Engineer:	CCR Architecture & Interiors	Engineer's Project No.:
Project:		
Contract Name:		
Bidder:		
Bidder's Address:		

You are notified that Owner on **[Commission Meeting Date]** has accepted your Bid dated **[date]** for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

[Describe Work, alternates, or sections of Work awarded]

The Contract Price of the awarded Contract is $**[Contract Price]**.

One (1) unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 10 days of the date of receipt of this Notice of Award:

1. Deliver to Owner one (1) counterpart of the Agreement, signed by Bidder (as Contractor).
2. Other conditions precedent (if any):

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement.

Owner: **City of Panama City**

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Copy: Architect/Engineer

NOTICE OF INTENT TO AWARD

Date of Issuance:

Owner: City of Panama City

Architect/Engineer: CCR A/E Project No: 21109

Project: Martin Luther King Jr. Recreation Center

Bidder:

Bidder's Address:

TO BIDDER:

You are notified that the City of Panama City Commissioner's intent to vote to award the Request For Proposal #PCXX-XXX *Name of Project to Name of Bidder*. The bid of $XXXXXX was received by the bid opening date and time and was determined to be the lowest, most responsive and qualified bid received as outlined in the Request For Proposal.

You must comply with the following conditions within 15 days of the date of receipt of this Notice of Intent to Award:

1. Deliver the contract security (performance and payment bonds) and insurance documentation as specified in the Instructions to Bidders.
2. Deliver to Owner the detailed Schedule of Values as outlined in document 00 43 73 Proposed Schedule of Values, Schedule of Submittals and Project Schedule.
3. Deliver to Owner list of all pre-installation meetings with approximate meeting dates.
4. Deliver to Owner list of preliminary items for direct purchase.

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default and annul this Notice of Intent to Award.

Owner: **City of Panama City**
By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Copy: Architect/Engineer

DOCUMENT 00 52 00 – AGREEMENT FORM

1.1 AGREEMENT FORM

A. AIA Document A101-2017 "Standard Form of Agreement Between Owner and Contractor," where basis of payment is a Stipulated Sum is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A101-2017, "Standard Form of Agreement Between Owner and Contractor," where basis of payment is a Stipulated Sum is bound in this Project Manual.

END OF DOCUMENT 00 52 00

AIA® Document A101® – 2017

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

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

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

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

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

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

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement.

AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

☐ The date of this Agreement.

☐ A date set forth in a notice to proceed issued by the Owner.

☐ Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

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

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

§ 3.3 Substantial Completion

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

☐ Not later than ( ) calendar days from the date of commencement of the Work.

☐ By the following date:

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

Portion of Work	Substantial Completion Date

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

Item	Price

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

Item	Price	Conditions for Acceptance

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

Item	Price

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

Item	Units and Limitations	Price per Unit ($0.00)

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

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

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

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

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

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

.1 That portion of the Contract Sum properly allocable to completed Work;

.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and

.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

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

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

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

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

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

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

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

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

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

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

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

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

§ 5.2 Final Payment

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

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

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

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

§ 5.3 Interest

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

_____ % _____

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

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

§ 6.2 Binding Dispute Resolution

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

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☐ Litigation in a court of competent jurisdiction

☐ Other *(Specify)*

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

ARTICLE 7 TERMINATION OR SUSPENSION

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

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

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

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

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

§ 8.5 Insurance and Bonds

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

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

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

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

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

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

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

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

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013 incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

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

.8 Other Exhibits:

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

☐ AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:

(Insert the date of the E204-2017 incorporated into this Agreement.)

☐ The Sustainability Plan:

Title	Date	Pages

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

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

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

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

DRAFT

AIA® Document A101® – 2017 Exhibit G

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 and location or address)

«Martin Luther King Jr. Recreation Center »
«705 East 14th Court, Panama City, FL 32401 »

THE OWNER:
(Name, legal status and address)

« City of Panama City, FL »
«501 Harrison Avenue, Panama City, FL »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

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.

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

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.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

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certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ 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 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. 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.3.2 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, 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.)

« See Attachment A-1, attached hereto and incorporated herein by reference »

§ A.3.2.2 Intentionally Omitted.

§ A.3.3 Intentionally Omitted.

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows:
(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	
Performance Bond	

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

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

« Attachment A-1 replaces all insurance requirements »

INSURANCE SCHEDULE - EXHIBIT I

Required By: City of Panama City

Project Name / #: MLK Recreation Center - 82395

The Subcontractor shall purchase and maintain the following types and limits of insurance listed below from a company or companies lawfully authorized and licensed to issue insurance in the jurisdiction where all work is performed. The insurer shall have an AM Best rating of "A-" or better.

COMMERCIAL GENERAL LIABILITY	**INSURANCE REQUIRED:** YES		
POLICY IS PER: Occurrence	**COVERAGE / MINIMUM LIMITS**		**GEN. AGG IS PER:** Project
	Per Occurrence	$1,000,000	
	General Aggregate	$2,000,000	ISO's CG 25 04 or equal
	Products-Completed Operations Aggregat	$2,000,000	
	Personal & Advertising Injury	$1,000,000	
	Damage To Premises Rented To You	$100,000	
	Medical Expense	$5,000	
	Deductibles/SIR	$50,000	Not To Exceed

POLICY FORM OR EQUIVALENT

ISO form CG 00 01 Edition date 10/01 or prior ISO edition. Subcontractor must disclose any endorsements that limit or exclude coverage customarily provided by ISO's CG 00 01.

ENDORSEMENTS REQUIRED - *or substantial equivalent - samples attached*

Type	ISO's	Edition Dates or Prior
Additional Insured	CG 11 85 or CG 20 10 & CG 20 37	12 19
Waiver of Subrogation	CG 24 04	12 19
Primary & Non-Contributory	CG 20 01	12 19
Riggers Liability Endorsement	endorsement required	

REQUIRED NAME OF PERSON(s) OR ORGANIZATION(s) - *scheduled on endorsements - samples attached*

City of Panama City, and any other parties as required by the contract documents.

PROHIBITED EXCLUSIONS OR RESTRICTIONS

Coverage shall include, but not be limited to, the following:

Bodily injury, property damage, and broad form contractual liability coverage | Premises liability | Independent contractors | No residential exclusion

Blanket contractual liability, including tort liability of another, assumed in a contract | Cross liability for additional insureds | No subsidence exclusion

Defense or indemnification obligations, including obligations, assumed under the Contract |

POST COMPLETION INSURANCE

Products & Completed Operations coverage is to remain in force from the date of completion of the Scope until the expiration of the statute of repose of the State in which the Project is located.

COMMERCIAL AUTO LIABILITY	**INSURANCE REQUIRED:** YES	
Combined Single Limit (CSL)	Any One Accident	$1,000,000

POLICY FORM OR EQUIVALENT

ISO's CA 00 01 or its substantial equivalent.

ENDORSEMENTS REQUIRED - *or substantial equivalent - (view attached samples)*

Type	ISO's	
Additional Insured	Required	
Waiver of Subrogation	Required	
Pollution Endorsements - as applicable	MCS-90	CA 9948 (Pollution Liability Broadened Coverage for Business

REQUIRED NAME OF PERSON OR ORGANIZATION

City of Panama City, and any other parties as required by the contract documents.

SCOPE OF COVERAGE

Liability coverage for all autos owned (Symbol 1), rented, hired, or borrowed by the contractors, and liability coverage for mobile equipment subject to compulsory insurance, financial responsibility laws or other motor vehicle insurance laws.

WORKER'S COMPENSATION	INSURANCE REQUIRED: YES		
Statutory Limits	Employers Liability (Part B)		
	Each Accident	$1,000,000	
	Disease - Each Employee	$1,000,000	
	Disease - Policy Limit	$1,000,000	
	Deductibles/SIR	$50,000	Not To Exceed

ENDORSEMENTS REQUIRED - *or substantial equivalent - (view attached samples)*

Type	NCCI	Notice
Waiver of Subrogation	WC 00 03 13	
Alternate Employer Endorsement	WC 00 03 01 A	
Worker's Comp Declaration Page	Part 3A - Must list all states where the Subcontractor is working	

WAIVER OF SUBROGATION REQUIRED

City of Panama City, and any other parties as required by the contract documents.

SCOPE OF COVERAGE

Suppose, the Worker's Compensation/Employer's Liability coverage is provided by a Professional Employer Organization (PEO). In that case, the broker must include a WC 00 03 01 A - Alternate / Leased Employer Endorsement or its substantial equivalent for that State, naming Subcontractor as the Alternate Employer.

If Subcontractor leases one or more employees through payroll, employee management, or other companies, Subcontractor must procure worker's compensation/employer's liability insurance directly. The insurance shall be written on a "Minimum Premium" or "If Any" policy form.

COVERAGE TERMS & CONDITIONS

The minimum limits of this insurance shall be no less than the statutory limits, even if Subcontractor is otherwise exempted under applicable state law.

USL&H | Jones Act | Endorsement – where applicable

Employers Liability/Stop Gap Liability if work is performed in Washington, Wyoming, Ohio, North Dakota, or the Commonwealth of Puerto Rico.

For the attainment of Worker's Compensation in monopolistic states and Puerto Rico, coverage must be secured through the state fund of that State.

The certificate must identify that coverage applies in the State where the Project is located.

UMBRELLA/EXCESS LIABILITY	INSURANCE REQUIRED: YES		
POLICY IS PER Occurrence	**COVERAGE / MINIMUM LIMITS**		
	Per Occurrence	$2,000,000	
	Aggregate	$2,000,000	
	Deductibles/SIR	$25,000	Not To Exceed

UNDERLYING INSURANCE COVERAGE

The umbrella or excess liability policy shall provide the same coverage as the underlying insurance coverages noted below.

Line of Coverage	Required
General Liability	Yes
Automobile Liability	Yes
Worker's Comp (Employers Liability)	Yes
Pollution	No
Professional	No

COVERAGE TERMS & CONDITIONS

Defense Cost	Duty to Defend
Drop Down Provision	Required for the Umbrella to drop down over the reduced or exhausted underlying policy aggregate
Primary Coverage	Umbrella or Excess Policy to primary to the Contractors general & automobile liability policies

INSURANCE DEFINITIONS
Scope: means the scope of work provided by the Contractor/Vendor under the Contract/Subcontract or the Goods and Services to be supplied and performed by the Contractor/Vendor under the Purchase Order, as applicable.
Project: means the project subject of the Contract/Purchase Order
Location: means the location subject to the Contract/Purchase Order.
ISO: Insurance Services Office - ISO develops and publishes policy language that many insurance companies use as the basis for their products.
Alternate/ Leased Employer Endorsement: is an endorsement added to a worker's compensation policy that provides an entity scheduled as an alternate employer with primary worker's compensation and employer liability coverage as if it were an insured under the policy. This endorsement is commonly used when a temporary help agency (the insured) is required by its customer (the alternate employer) to protect the alternate employer from claims brought by the insured's employees.

GENERAL INSURANCE REQUIREMENTS
Additional Insureds - All insurance required by this contract (excluding Worker's Compensation Insurance) shall name Indemnified Parties, including The City of Panama City, and any other parties as required by the contract documents as additional insureds and shall be primary and non-contributory to any insurance maintained by Indemnified Parties and Additional Insureds.
Waiver of Subrogation - All insurance required by this contract (excluding Worker's Compensation Insurance) shall name Indemnified Parties, including The City of Panama City, and any other parties as required by the contract documents as additional insureds and shall be primary and non-contributory to any insurance maintained by Indemnified Parties and Additional Insureds.
Primary and Non-Contributory - It is the specific intent of the parties that all insurance required herein (except Worker's Compensation, Employer's Liability, and Professional Liability) shall be primary to and shall seek no contribution from all insurance held by Contractor or Owner, with Contractor's and Owner's insurance being excess, secondary, and non-contributory.
Subcontractors - Lower Tier Subcontractors - Before permitting any lower tier Sub-subcontractors to perform Scope under the Contract, Subcontracotr shall require its Sub-subcontractors to maintain insurance in like form and amounts to that required herein and provide evidence to Contractor. Consideration for specific trades can be made with prior approval by the Contractor.
Notice of Cancellation - All insurance coverages required by this contract shall contain a provision that the coverage afforded hereunder cannot be canceled, non-renewed, allowed to lapse, or have any restricted modifications added unless at least Thirty Days (30) days prior written notice has been given.
Insurance Policy Review - upon request, we can receive copies of all insurance policies. Insurance policies shall not contain unacceptable exclusions, and all insurance carriers must certify policies as accurate and complete.We have the right to review and approve all insurance policies will not constitute a waiver of any rights created by or provisions contained in this contract should they differ from those in such policies.
Vendor Compliance and Insurance Tracking Software - The insurance and indemnification requirements of a Contract or Lease are vital to risk transfer and assumption. We understand that risk transfer is only achieved when a claim is successfully tendered to the responsible party or insurance carrier. Therefore, our company will use advanced verification software to manage insurance compliance for all projects or locations to maintain proper risk transfer or risk assumption for all contractors, vendors, subcontractors, or tenants. [Fee Based] A supplemental application will apply.

Legal Disclaimer. The Information herein is for general guidance of matter only and not legal advise

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
Required

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME: Required	
Insurance Producer/Agent contact information completed including email address. We will respond directly to the Agent for any revisions needed	PHONE (A/C, No, Ext): Required	FAX (A/C, No):
	E-MAIL ADDRESS: Required	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Required	Required
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED

Named Insured legal entity name/address stated as it is listed with the Secretary of State. If "dba" is used it must be in conjunction with the legal entity name.

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
Required	COMMERCIAL GENERAL LIABILITY [ ] CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: [ ] POLICY [X] PRO-JECT [ ] LOC [ ] OTHER:	Y	Y	Required	Required	Required	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 300,000 $ 5,000 $ 1,000,000 $ 2,000,000 $ 2,000,000
Required	AUTOMOBILE LIABILITY *Optional = Owned or Scheduled Auto are compliant if Hired & Non Owned is included* [X] ANY AUTO [ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS [ ] HIRED AUTOS ONLY [ ] NON-OWNED AUTOS ONLY	Y	Y	Required	Required	Required	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ 500,000 $ 1,000,000 $ 500,000
Required	[X] UMBRELLA LIAB [X] OCCUR [ ] EXCESS LIAB [ ] CLAIMS-MADE [X] DED [ ] RETENTION $ $25,000						EACH OCCURRENCE AGGREGATE	$ 2,000,000 $ 2,000,000
Required	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY *Note: Coverage must apply to the state in which the work is being performed* ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y / N [N/Y] **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A	Y	Required	Required	Required	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000

Optional

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

All projects performed for The City of Panama City.
All insurance (excluding Workers Compensation and Professional Liability) include The City of Panama City, indemnified parties, any other parties as required by contract documents and their respective directors, officers, employees, and affiliates as additional insureds, and shall be primary and non-contributory to any insurance maintained by additional insureds."

CERTIFICATE HOLDER

City of Panama City
501 Harrison Ave
Panama City
Florida 32401

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Required

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location(s) Of Covered Operations
City of Panama City,and additional insured's as required by written contract or agreement	Any location for which the Named Insured's work was performed for such person(s) or organization(s) for any Ongoing Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or

2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and

2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or

2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

C. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable limits of insurance;

whichever is less.

This endorsement shall not increase the applicable limits of insurance.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s)	Location And Description Of Completed Operations
City of Panama City,and additional insured's as required by written contract or agreement	Any location for which the Named Insured's work was performed for such person(s) or organization(s) for any Completed Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **Section II – Who Is An Insured** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the Schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

However:

1. The insurance afforded to such additional insured only applies to the extent permitted by law; and

2. If coverage provided to the additional insured is required by a contract or agreement, the insurance afforded to such additional insured will not be broader than that which you are required by the contract or agreement to provide for such additional insured.

B. With respect to the insurance afforded to these additional insureds, the following is added to **Section III – Limits Of Insurance:**

If coverage provided to the additional insured is required by a contract or agreement, the most we will pay on behalf of the additional insured is the amount of insurance:

1. Required by the contract or agreement; or

2. Available under the applicable limits of insurance;

whichever is less.

This endorsement shall not increase the applicable limits of insurance.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

WAIVER OF TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US (WAIVER OF SUBROGATION)

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
ELECTRONIC DATA LIABILITY COVERAGE PART
LIQUOR LIABILITY COVERAGE PART
POLLUTION LIABILITY COVERAGE PART DESIGNATED SITES
POLLUTION LIABILITY LIMITED COVERAGE PART DESIGNATED SITES
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART
RAILROAD PROTECTIVE LIABILITY COVERAGE PART
UNDERGROUND STORAGE TANK POLICY DESIGNATED TANKS

SCHEDULE

Name Of Person(s) Or Organization(s):
City of Panama City,and additional insured's as required by written contract or agreement
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

The following is added to Paragraph **8. Transfer Of Rights Of Recovery Against Others To Us** of **Section IV – Conditions:**

We waive any right of recovery against the person(s) or organization(s) shown in the Schedule above because of payments we make under this Coverage Part. Such waiver by us applies only to the extent that the insured has waived its right of recovery against such person(s) or organization(s) prior to loss. This endorsement applies only to the person(s) or organization(s) shown in the Schedule above.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

PRIMARY AND NONCONTRIBUTORY – OTHER INSURANCE CONDITION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART
LIQUOR LIABILITY COVERAGE PART
PRODUCTS/COMPLETED OPERATIONS LIABILITY COVERAGE PART

The following is added to the **Other Insurance** Condition and supersedes any provision to the contrary:

Primary And Noncontributory Insurance

This insurance is primary to and will not seek contribution from any other insurance available to an additional insured under your policy provided that:

(1) The additional insured is a Named Insured under such other insurance; and

(2) You have agreed in writing in a contract or agreement that this insurance would be primary and would not seek contribution from any other insurance available to the additional insured.

WAIVER OF OUR RIGHT TO RECOVER FROM OTHERS ENDORSEMENT

We have the right to recover our payments from anyone liable for an injury covered by this policy. We will not enforce our right against the person or organization named in the Schedule. (This agreement applies only to the extent that you perform work under a written contract that requires you to obtain this agreement from us.)

This agreement shall not operate directly or indirectly to benefit anyone not named in the Schedule.

Schedule

In Favor of:
City of Panama City, and additional insured's as required by written contract or agreement

Work Performed by: **Your Client (Our Subcontractor/Vendor)**

Note: If workers compensation coverage is provided by a PEO - Employee leasing, The "Worked Performed by" cannot reference "Leased Employees"

On the Following Project or Location **All Projects or Locations as Required by Contract**

Waiver of Subrogation endorsement not required in states such as: KY, NH, NJ, UT, or MO per state law Stop Gap endorsement required in monopolistic states such as: ND, OH, WA WY or Puerto Rico

This endorsement changes the policy to which it is attached and is effective on the date issued unless otherwise stated.

(The information below is required only when this endorsement is issued subsequent to preparation of the policy.)

Endorsement
Insured **Required**

Effective Policy No.
Required

Endorsement No.
Premium

Countersigned by_____

Insurance Company
Required

WC 00 03 13
(Ed. 4-84)

ALTERNATE EMPLOYER ENDORSEMENT

This endorsement applies only with respect to bodily injury to your employees while in the course of special or temporary employment by the alternate employer in the state named in Item 2 of the Schedule. Part One (Workers Compensation Insurance) and Part Two (Employers Liability Insurance) will apply as though the alternate employer is insured. If an entry is shown in Item 3 of the Schedule the insurance afforded by this endorsement applies only to work you perform under the contract or at the project named in the Schedule.

Under Part One (Workers Compensation Insurance) we will reimburse the alternate employer for the benefits required by the workers compensation law if we are not permitted to pay the benefits directly to the persons entitled to them.

The insurance afforded by this endorsement is not intended to satisfy the alternate employer's duty to secure its obligations under the workers compensation law. We will not file evidence of this insurance on behalf of the alternate employer with any government agency.

We will not ask any other insurer of the alternate employer to share with us a loss covered by this endorsement.

Premium will be charged for your employees while in the course of special or temporary employment by the alternate employer.

The policy may be canceled according to its terms without sending notice to the alternate employer.

Part Four (Your Duties If Injury Occurs) applies to you and the alternate employer. The alternate employer will recognize our right to defend under Parts One and Two and our right to inspect under Part Six.

Schedule

1. **Alternate Employer**
   YOUR CLIENT (OUR VENDOR)-NOT THE PEO
   Address
   YOUR CLIENTS ADDRESS
2. **State of Special or Temporary Employment**
   APPLICABLE STATES
3. **Contract or Project**
   ALL CONTRACTS OR PROJECTS

This endorsement changes the policy to which it is attached and is effective on the date issued unless otherwise stated.

(The information below is required only when this endorsement is issued subsequent to preparation of the policy.)

Endorsement Effective **DATE IS REQUIRED**

Policy No.
POLICY NUMBER REQUIRED

Endorsement No.

Premium $

Insured
REQUIRED

Countersigned by_____

Insurance Company
REQUIRED

WC 00 03 01 A
(Ed 2-89)

APPENDIX 4: FEDERAL REGULATIONS CONTRACT REQUIREMENTS

FEDERAL EMERGENCY MANAGEMENT AGENCY

The supplemental conditions contained in this section are intended to cooperate with, to supplement, and to modify the general conditions and other specifications. In cases of disagreement with any other section of this contract, the Supplemental Conditions shall govern.

Contractor means an entity that receives a contract.

The services performed by the awarded Contractor shall be in compliance with all applicable grantor regulations/requirements, and additional requirements specified in this document. It shall be the awarded Contractor's responsibility to acquire and utilize the necessary manuals and guidelines that apply to the work required to complete this project.

In general,

1) The contractor (including all subcontractors) must insert these contract provisions in each lower tier contracts (e.g. subcontract or sub-agreement);

2) The contractor (or subcontractor) must incorporate the applicable requirements of these contract provisions by reference for work done under any purchase orders, rental agreements and other agreements for supplies or services;

3) The prime contractor is responsible for compliance with these contract provisions by any subcontractor, lower-tier subcontractor or service provider.

FEDERAL CONTRACT PROVISIONS

1. **Conflict of Interest -** This Contract/Work Order is subject to chapter 112, F.S. The vendor shall disclose the name of any officer, director, employee, or other agent who is also an employee of the State. Contractor shall also disclose the name of any State employee who owns, directly or indirectly, more than a five percent (5%) interest in the Contractor's company or its affiliates.

2. **Discriminatory Vendors** – (1) No person, on the grounds of race, creed, color, religion, national origin, age, gender, or disability, shall be excluded from participation in; be denied the proceeds or benefits of; or be otherwise subjected to discrimination in performance during the term of the contract. (2) Contractor shall disclose if they appear on the discriminatory vendor list. An entity or affiliate placed on the discriminatory vendor list pursuant to section 287.134, F.S. may not: 1) Submit a bid on an agreement to provide any goods or services to a public entity; 2) Submit a bid on an agreement with a public entity for the construction or repair of a public building or public work; 3) Submit bids on leases of real property to a public entity; or 4) Be awarded or perform work as a consultant under an agreement with any public entity; or transact business with any public entity.

3. **Lobbying** - No funds received pursuant to this Agreement may be expended for lobbying the Federal or State Legislature, the judicial branch, or a federal or state agency. The bidder or offeror

certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that: (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement. (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions. (3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, sub-grants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure

4. **Record Retention** – A. The contractor shall maintain and retain sufficient records demonstrating its compliance with the terms of the Agreement for a period of at least five (5) years after final payment is made and shall allow the City, the State, or its authorized representatives access to such records for audit purposes upon request. B. In the event of litigation or settlement of claims arising from the performance of this contract, in which case contractor agrees to maintain same until the City, the FEMA Administrator, the Comptroller General of the United States, or any of their duly authorized representatives, have disposed of all such litigation, appeals, claims or exceptions related to the litigation or settlement of claims

5. **Diversity –** All contracting and subcontracting opportunities afforded by this solicitation/contract embrace diversity enthusiastically. The award of subcontracts should reflect the full diversity of the citizens of the State of Florida. Firms qualifying under this solicitation are encouraged to submit bids/proposals. Award of this contract will be conditioned upon satisfying the requirements of this bid specification. These requirements apply to all bidders/offerors, including those who qualify as a Minority Business vendor. A list of minority owned firms that could be offered subcontracting opportunities may be obtained by contacting the Office of Supplier Diversity at (850) 487-0915.

6. **Applicable Laws** - The Contractor shall comply with all applicable federal, state and local rules and regulations in providing services to the Consortium. The Contractor acknowledges that this requirement includes, but is not limited to, compliance with all applicable federal, state and local health and safety rules and regulations and that FEMA financial assistance may be used to fund the contract. As such, the contractor will comply will all applicable federal law, regulations, executive orders, FEMA policies, procedures, and directives.

7. **Administrative, Contractual, or Legal Remedies -** Unless otherwise provided in this contract, all claims, counter-claims, disputes and other matters in question between the local government and the contractor, arising out of or relating to this contract, or the breach of it, will be decided by arbitration, if the parties mutually agree, or in a Florida court of competent jurisdiction.

8. **Patents and Data** - No reports, maps, or other documents produced in whole or in part under this contract shall be the subject of an application for copyright by or on behalf of the contractor. The grantor agency and the grantee shall possess all rights to invention or discovery, as well as rights in data which may arise as a result of the contractor's services.

9. **Clean Air Act and Federal Water Pollution Control Act -** (1) The Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 *et seq*. (2) The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 *et seq*. (3) The Contractor agrees to report each violation to the Consortium member and understands and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office. (4) The Contractor agrees to include these requirements in each subcontract exceeding $100,000 financed in whole or in part with Federal assistance provided by FEMA.

10. **Suspension and Debarment** (1) This contract is a covered transaction for purposes of 2 C.F.R.pt. 180 and 2 C.F.R. pt. 3000. As such the contractor is required to verify that none of the contractor, its principals (defined at 2 C.F.R. § 180.995), or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935). (2) The contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. (3) This certification is a material representation of fact relied upon by the City. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to the Florida Department of Emergency Management, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment. (4) The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions." (5) The Contractor's debarment and suspension status will be validated by the City at the System for Award Management at **www.sam.gov** and the State of Florida at: https://www.dms.myflorida.com/businessoperations/statepurchasing/vendorinformation/convictedsuspendeddiscriminatorycomplaintsvendorlists.

11. **Reporting** - The contractor will provide any information required to comply with the grantor agency requirements and regulations pertaining to reporting. It is important that the contractor is aware of the reporting requirements of the City, as the Federal or State granting agency may require the contractor to provide certain information, documentation, and other reporting in order to satisfy reporting requirements to the granting agency.

12. **Access to Records –** (1) The contractor agrees to provide the City, the FEMA Administrator, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions. (2) The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed. (3) The contractor agrees to provide the FEMA Administrator or his authorized representatives' access to construction or other work sites pertaining to the work being completed under the contract."

13. **Energy Efficiency Standards** - The contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act.

14. **DHS Seal, Logo, and Flags -** "The contractor shall not use the DHS seal(s), logos, crests, or reproductions of flags or likenesses of DHS agency officials without specific FEMA pre- approval."

15. **No Obligation by Federal Government** - The Federal Government is not a party to this contract and is not subject to any obligations or liabilities to the non-Federal entity, contractor, or any other party pertaining to any matter resulting from the contract.

16. **Program Fraud and False or Fraudulent Statements or Related Acts** - The contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the contractor's actions pertaining to this contract."

17. **Recovered Materials** –

(1) In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA designated items unless the product cannot be acquired (i) Competitively within a timeframe providing for compliance with the contract performance schedule; (ii) Meeting contract performance requirements; or (iii) At a reasonable price.

(2) Information about this requirement is available at EPA's Comprehensive Procurement Guidelines web site, http://www.epa.gov/cpg/. The list of EPA-designate items is available at http://www.epa.gov/cpg/products.htm.

18. **Discriminatory Vendors List**: In accordance with Section 287.134, Florida Statutes, an entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity, and may not transact business with any public entity.

19. **Contracting With Small And Minority Businesses, Women's Business Enterprises, And Labor Surplus Area Firms**

(a) The non-Federal entity must take all necessary affirmative steps to assure that minority businesses, women's business enterprises, and labor surplus area firms are used when possible.

(b) Affirmative steps must include:

(1) Placing qualified small and minority businesses and women's business enterprises on solicitation lists;

(2) Assuring that small and minority businesses, and women's business enterprises are solicited whenever they are potential sources;

(3) Dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses, and women's business enterprises;

(4) Establishing delivery schedules, where the requirement permits, which encourage participation by small and minority businesses, and women's business enterprises;

(5) Using the services and assistance, as appropriate, of such organizations as the Small Business Administration and the Minority Business Development Agency of the Department of Commerce; and

(6) Requiring the prime contractor, if subcontracts are to be let, to take the affirmative steps listed in paragraphs (1) through (5) of this section.

20. Equal Opportunity Clauses

Compliance with Regulations: The contractor shall comply with the Acts and the Regulations relative to Nondiscrimination in federally-assisted programs, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, that if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance. The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the

equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

21. Contract Work Hours And Safety Standards Act 40 U.S.C. 3702 And 3704, As Supplemented By Department Of Labor Regulations (29 CFR Part 5)

Compliance with the Contract Work Hours and Safety Standards Act.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-halftimes the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The City shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

22. Rights To Inventions Made Under A Contract Or Agreement

If the Federal award meets the definition of "funding agreement" under 37 CFR § 401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

23. Byrd Anti-Lobbying Amendment 31 U.S.C. § 1352 (As Amended)

Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended). Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient.

24. Prohibition on Contracting for Covered Telecommunications Equipment or Services

(a)*Definitions.* As used in this clause, the terms backhaul; covered foreign country; covered telecommunications equipment or services; interconnection arrangements; roaming; substantial or essential component; and telecommunications equipment or services have the meaning as defined in FEMA Policy, #405-143-1 Prohibitions on Expending FEMA Award Funds for Covered Telecommunications Equipment or Services As used in this clause.

(b)*Prohibitions.*

(1) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after Aug.13, 2020, from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons.

(2) Unless an exception in paragraph (c) of this clause applies, the contractor and its subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds from the Federal Emergency Management Agency to:

(i) Procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(ii) Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology of any system;

(iii) Enter into, extend, or renew contracts with entities that use covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system; or

(iv) Provide, as part of its performance of this contract, subcontract, or other contractual instrument, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system.

(c)*Exceptions.*

(1) This clause does not prohibit contractors from providing—

a. A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

b. Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(2) By necessary implication and regulation, the prohibitions also do not apply to:

a. Covered telecommunications equipment or services that:

i. Are not used as a substantial or essential component of any system; and

ii. Are not used as critical technology of any system.

b. Other telecommunications equipment or services that are not considered covered telecommunications equipment or services.

(d)*Reporting requirement.*

(1) In the event the contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the contractor is notified of such by a subcontractor at any tier or by any other source, the contractor shall report the information in paragraph (d)(2) of this clause to the recipient or subrecipient, unless elsewhere in this contract are established procedures for reporting the information.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause:

(i) Within one business day from the date of such identification or notification: The contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: Any further available information about mitigation actions undertaken or recommended. In addition, the contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e)*Subcontracts.* The Contractor shall insert the substance of this clause, including this paragraph(e), in all subcontracts and other contractual instruments.

25. Domestic preferences for procurements

(a) As appropriate and to the extent consistent with law, the non-Federal entity should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award.

(b) For purposes of this section:

(1) "Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

(2) "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

26. **CIVIL RIGHTS ACT OF 1964**. The Consultant will abide by the provisions of the Civil Rights Act of 1964 which states that under Title VII, no person may, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. Consultant agrees that it shall not discriminate by race, gender, color, age, religion, national origin, marital status, or disability in connection with its performance under this Agreement. Furthermore, Consultant agrees that no otherwise qualified individual shall solely by reason of his/her race, gender, color, age, religion, national origin, marital status or disability be excluded from the participation in, be denied benefits of, or be subjected to, discrimination under any program or activity called for or required in connection with services rendered under this Agreement.

27. **(If/When Applicable) SECTION 109 OF THE HOUSING AND COMMUNITY DEVELOPMENT ACT OF 1974**. The Consultant will comply with the following provision: No person in the United States may on the grounds of race, color, national origin, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with the funds made available under this title. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975 or with respect to an otherwise qualified handicapped individual as provided in Section 504 of the Rehabilitation Act of 1973 will also apply to any such program or activity.

28. **(If/When Applicable) SECTION 3 OF THE HOUSING AND URBAN DEVELOPMENT ACT OF 1968**. The Consultant will ensure that to the greatest extent feasible, opportunities for training and employment arising in connection with this CDBG-assisted project will be extended to lower income project area residents. Further, the Consultant will, to the greatest extent feasible, utilize business concerns located in or substantially owned by residents of the project area, in the award of contracts and purchase of services and supplies.

EXHIBIT H – A101

Environmental Compliance
Anticipated FEMA EHP Conditions

Construction and equipment-generated fugitive dust will be controlled using standard construction best management practices (BMPs), including watering of exposed surfaces, and enclosing or covering stockpiled material.

Vegetative debris generated during construction activities will require authorization from FDEP for any staging and disposal activities. The contractor will ensure that all debris is separated and disposed at permitted facilities or at a disposal site or landfill authorized by FDEP.

Any hazardous materials discovered, generated, or used during implementation will be disposed of and handled in accordance with applicable state and federal regulations. Any permits, or authorizations, if required, would be obtained prior to handling and disposal.

Use of BMPs during construction to minimize impacts is required, appropriate permits will be acquired by the contractor, and guidelines will be followed to minimize stormwater impacts. The contractor will ensure a National Pollutant Discharge Elimination System (NPDES) permit and a Stormwater Pollution Prevention Plan (SWPPP) are obtained.

A stormwater management system to satisfy the Florida Stormwater Quality and Quantity standards is required so that adverse water quantity or offsite flooding impacts, cause or contribute to violations of surface water standards, including any antidegradation provisions, and any special standards for Outstanding Florida Waters (OFW) and Outstanding National Resource Waters (ONRW). The stormwater management system will be permitted through the Florida Environmental Resource Permitting (ERP) program.

Hazardous materials used and hazardous wastes generated during construction will be managed in accordance with applicable environmental compliance regulations to prevent releases to groundwater.

Noise generated during construction will be limited to daylight hours to limit the duration of disturbance to wildlife.

Noise generated from construction activities described will be intermittent, heard only during daytime, and only for the duration of the project activities.

Construction vehicles and equipment will be stored onsite during the project or at existing access points within the right-of-way.

If human remains or intact archaeological deposits are uncovered, work in the vicinity of the discovery will stop immediately and all reasonable measures to avoid or minimize harm to the finds will be taken. The applicant will ensure that archaeological discoveries are secured in place, that access to the sensitive area is restricted, and that all reasonable measures are taken to avoid further disturbance of the discoveries. The applicant's contractor will provide immediate notice of such discoveries to the applicant. The applicant shall contact the Florida Division of Historic Resources and FEMA within 24 hours of the discovery. Work in the vicinity of the discovery may not resume until FEMA has completed

consultation with SHPO, Tribes, and other consulting parties as necessary. In the event that unmarked human remains are encountered during permitted activities; all work shall stop immediately, and the proper authorities notified in accordance with Florida Statutes, Section 872.05.

Any inadvertent discoveries of cultural resources, human remains, and related Native American Graves Protection and Repatriation Act (NAGPRA) items may occur, even in areas of existing or prior development. Should this occur, the Muscogee (Creek) Nation requests that all work cease and our office as well as other appropriate agencies be notified immediately.

To minimize occupational health and safety risks, workers will wear and use appropriate personal protective equipment and follow all applicable Occupational Safety and Health Administration (OSHA) standards and procedures.

A health and safety plan will be required and implemented prior to beginning work. Work areas will be clearly marked with appropriate signage and secured against unauthorized entry. Standard construction traffic control measures will be used to protect workers, residents, and the travelling public.

Any change to the approved scope of work will require re-evaluation for compliance with NEPA and other Laws and Executive Orders.

Contractor obtains all appropriate federal, state and local environmental permits and clearances.

DOCUMENT 00 61 13 – PERFORMANCE AND PAYMENT BOND

1.1 PERFORMANCE AND PAYMENT BOND

A. AIA Document A312 - 2010, "Payment Bond," is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A312 - 2010, "Payment Bond," is bound in this Project Manual.

END OF DOCUMENT 00 61 13

AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

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

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

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

OWNER:
(Name, legal status and address)

CONSTRUCTION CONTRACT
Date:

Amount:

Description:
(Name and location)

BOND
Date:
(Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond: ☐ None ☐ See Section 16

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

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

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 14 Definitions

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

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

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

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

Init.

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DOCUMENT 00 65 20 – CONTRACTOR'S AFFIDAVIT OF PAYMENT AND RELEASE OF LIEN

1.1 CONTRACTOR'S AFFIDAVIT OF PAYMENT AND RELEASE OF LIEN

A. AIA Documents G706-1994 "Contractor's Affidavit of Release of Liens" and G706A-1994, "Contractor's Affidavit of Payment and Release of Lien," are hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Documents G706-1994 "Contractor's Affidavit of Release of Liens" and G706A-1994, "Contractor's Affidavit of Payment and Release of Lien," are bound in this Project Manual.

END OF DOCUMENT 00 65 20

AIA® Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

TO OWNER: *(Name and address)*

CONTRACT DATED:

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
SURETY ☐
OTHER ☐

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707™, Consent of Surety to Final Payment, may be used for this purpose.
   Indicate attachment: ☐ Yes ☑ No

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof
3. Contractor's Affidavit of Release of Liens (AIA Document G706A™)

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

AIA® Document G706A™ – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*

ARCHITECT'S PROJECT NUMBER:

CONTRACT FOR:

TO OWNER: *(Name and address)*

CONTRACT DATED:

OWNER ☐
ARCHITECT ☐
CONTRACTOR ☐
SURETY ☐
OTHER ☐

STATE OF:

COUNTY OF:

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:

CAUTION: You should sign an original AIA Contract Document, on which this text appears in RED. An original assures that changes will not be obscured.

DOCUMENT 00 65 36 – **CONTRACTOR WARRANTY FORM**

PROJECT: Martin Luther King Jr. Recreation Center
LOCATION: 705 East 14th Court, Panama City, FL 32401
OWNER: City of Panama City, FL

We, _____, Contractor for
(Company Name)

the above-referenced project, do hereby warrant that all labor and materials furnished, and work performed are in accord with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of one year from Date of Substantial Completion. This warranty commences on

_____
(Date of Substantial Completion affixed by Architect)

and expires on _____.
(Expiration Date)

Should defects develop during the warranty period due to improper materials, workmanship or arrangement, the same, including adjacent work displaced, shall be made good by the undersigned at no expense to the Owner.

The Owner will give Contractor written notice of defective work. Should Contractor fail to correct defective work within 60 days after receiving written notice, the Owner may, at his option, correct defects and charge Contractor costs for such correction. Contractor agrees to pay such charges upon demand. Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

FOR _____
(Company Name)

BY _____

TITLE _____

DATE _____

END OF CONTRACTOR WARRANTY FORM

This Document uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions. Text of this Document consists of Project-specific data. Examples given in the model document text illustrate possible document content. Use the model text to develop text for specific Project requirements. "Permit Application" is a "MasterFormat" classification title for data that are made available for Bidders' and Contractor's convenience but are not incorporated into the Contract Documents.

DOCUMENT 00 65 37 – **INSTALLER WARRANTY FORM**

PROJECT: Martin Luther King Jr. Recreation Center

LOCATION: 705 East 14th Court, Panama City, FL 32401

OWNER: City of Panama City, FL

GENERAL CONTRACTOR:

We, _____, Installer
(Company Name)

for _____, as described
(List Trade)

in Specification Section(s) _____

_____,
(List appropriate sections of Specifications)

do hereby warrant that all labor and materials furnished and work performed in conjunction with the above-referenced project are in accord with the Contract Documents and authorized modifications thereto, and will be free from defects due to defective materials or workmanship for a period of _____ year(s) from Date of Substantial Completion. This warranty commences on

_____
(Date of Substantial Completion affixed by Architect)

and expires on _____. (Expiration Date)

Should defects develop during the warranty period due to improper materials, workmanship or arrangement, the same, including adjacent work displaced, shall be made good by the undersigned at no expense to the Owner.

The Owner will give Installer written notice of defective work. Should Installer fail to correct defective work within 60 days after receiving written notice, the Owner may, at his option, correct defects and charge Installer costs for such correction. Installer agrees to pay such charges upon demand.

Nothing in the above shall be deemed to apply to work which has been abused or neglected by the Owner.

FOR _____	FOR _____
(General Contractor)	(Installer's Company Name)
BY _____	BY _____
TITLE _____	TITLE _____

END OF INSTALLER WARRANTY FORM

DOCUMENT 00 72 00 – GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

1.1 GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

A. AIA Document A201 - 2017, "General Conditions of the Contract for Construction," is hereby incorporated into the Procurement and Contracting Requirements by reference.

1. A copy of AIA Document A201 - 2017, "General Conditions of the Contract for Construction," is bound in this Project Manual.

END OF DOCUMENT 00 72 00

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)

THE ARCHITECT:
(Name, legal status and address)

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

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

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining

provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

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

information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the

site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

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

capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 Supervision and Construction Procedures

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

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes

remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

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

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

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

.2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent

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

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

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

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

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

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

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

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

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

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

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

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The

Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

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

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.3 Delays and Extensions of Time

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable

by the Owner to the Contractor for performance of the Work under the Contract Documents.

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

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

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The

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

§ 9.5 Decisions to Withhold Certification

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

.1 defective Work not remedied;

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

§ 9.6 Progress Payments

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

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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers

to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

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

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

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

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

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by he Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

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

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

constitute a waiver of Claims.

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

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

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property
If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances
§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies
In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS
§ 11.1 Contractor's Insurance and Bonds
§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the

endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

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

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The

Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the

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Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

.2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;

.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or

.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

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§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section

15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly

consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

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DOCUMENT 00 73 00 – SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION (AIA A201-2017)

PART 1 - STANDARD GENERAL CONDITIONS

1.1 STANDARD GENERAL CONDITIONS

A. The following form of General Conditions shall be used for this Project:

1. American Institute of Architect's (AIA) Document A201-2017, "*General Conditions of the Contract for Construction*", inclusive, is a part of this Contract, it is incorporated herein.
2. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aiacontracts.org/: email: docspurchases@aia.org; phone: (800) 942-7732.

B. The Contractor is hereby specifically directed, as a condition of the Contract, to acquaint themself with the Articles contained therein and to notify and appraise all Subcontractors, Suppliers and any other parties of the Contract or individuals or agencies engaged in the work as to its contents.

C. No contractual adjustments shall be due or become exigent as a result of, or failure on the part of the Contractor to fully acquaint themself and all other parties to the contract with the conditions of AIA Document A201-2017

PART 2 - SUPPLEMENTARY CONDITIONS

The following supplements modify, change, delete from or add to the AIA Document A201-2017, "*General Conditions of the Contract for Construction*". Where a portion of the General Conditions of the Contract for Construction is modified or deleted by these Supplementary General Conditions of the Contract for Construction, unaltered portions of the General Conditions of the Contract for Construction shall remain in effect. Where any Article of the General Conditions is modified or any Paragraph, Subparagraph or Clause thereof is modified or deleted by these supplements, the unaltered provisions of that Article, Paragraph, Subparagraph or clause shall remain in effect.

2.1 ARTICLE 1: GENERAL PROVISIONS

A. 1.1 Basic Definitions

1. Add the following § 1.1.5.1 to § 1.1.5:

§ 1.1.5.1 The word "Drawings" refers to and indicates all drawings or reproductions of drawings pertaining to construction of work contemplated, and its appurtenances.

2. Add the following § 1.1.6.1 to § 1.1.6:

§ 1.1.6.1 The word "Specifications" refers and indicates descriptions, provisions, and requirements contained herein together with all written agreements made or to be made, pertaining to method and manner of performing work, or to quantities and qualities of materials to be furnished under the Contract.

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

1. Add the following § 1.2.1.2 to § 1.2.1:

§ 1.2.1.2 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. The Agreement.
2. Addenda, with those of later date having precedence over those of earlier date.
3. The General Conditions of the Contract for Construction.
4. The Supplementary Conditions.
5. Drawings and Specifications.

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

2.2 ARTICLE 2: OWNER

A. 2.3 Information and Services Required of the Owner

1. Delete § 2.3.6 and substitute the following:

§ 2.3.6 The Owner will furnish to the Contractor Construction Documents (Drawings and Project Manuals) in PDF format for reproduction as required for construction of this project and pursuant to Section 1.5.2. All copies are the responsibility of the contractor.

2.3 ARTICLE 3: CONTRACTOR

A. 3.2 Review of Contract Documents and Field Conditions by Contractor

1. Add the following to the end of § 3.2.2:

Prior to commencing any excavation or grading, the Contractor shall satisfy himself as to the accuracy of all survey data as indicated in these Drawings and Specifications and/or as provided by Owner. Should the Contractor discover any inaccuracies, errors, or omissions in the survey data, the Contractor shall immediately notify the Architect in order that proper adjustments can be anticipated and ordered. Commencement by the contractor of any excavation or grading shall be held as an acceptance of the survey data by the Contractor, after which time the Contractor has no claim against the Owner resulting from alleged errors, omissions or inaccuracies of the said survey data.

2. Add the following §§ 3.2.5, 3.2.6, and 3.2.8, to § 3.2:

§ 3.2.5 If, in Contractor's opinion, any work is indicated on Drawings, or is specified in such as manner as will make it impossible to produce a generally acceptable piece of work, or should discrepancies appear between drawings and specifications, he shall refer it to Architect for decision before proceeding with Work.

§ 3.2.6 If Contractor fails to make such reference, no excuse will thereafter be entertained for failure to carry out work in satisfactory manner. Should a conflict occur in or between Drawings or Specifications, Contractor shall be deemed to have estimated on a more expensive way of doing work unless he shall have asked for and obtained a decision, in writing, from Architect before submission of proposal as to which method or materials will be required.

§ 3.2.7 Figures govern scale dimensions and large-scale drawings govern those of smaller scale. If drawings and specifications conflict or require any clarification that was not obtained prior to bidding, the Contractor shall estimate and include in his work the more expensive method or material. No deviation shall be made from plans and specifications except upon written order of the Architect.

B. 3.3 Supervision and Construction Procedure

1. Add the following §§ 3.3.4 and 3.3.5 to § 3.3:

§ 3.3.4 The Contractor shall furnish sufficient forces, construction plans and equipment, and shall work such hours, including night shifts and overtime operation, as may be necessary to insure the execution of the Work in accordance with the approved progress schedule. If the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve the progress by increasing the number of shifts, overtime operations, days of work and the amount of construction plans, all without additional cost to the Owner.

§ 3.3.5 Failure of the Contractor to comply with the requirements under this provision shall be grounds for determination by the Architect that the Contractor is not executing the Work with such diligence as will ensure completion within the time specified and such failure may constitute a substantial violation of the conditions of the Agreement.

C. 3.4 Labor and Materials

1. Add the following §§ 3.4.4, 3.4.5, 3.4.6 and 3.4.7 to § 3.4:

§ 3.4.4 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 1 of the Specifications), Section "Product Requirements.".

§ 3.4.5 By making requests for substitutions based on § 3.4.4 above, the Contractor:

1. Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
2. Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
3. Certifies that the cost data presented is complete and includes all related costs under this Contract, including the Architect's or Engineer's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and
4. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

§ 3.4.6 The Contractor shall follow all specified and manufacturer's standards for Delivery, Storage and Handling of all products. All products that require storage in a climate-controlled environment shall be so handled. In all cases the more stringent guidelines shall be followed.

§ 3.4.7 The Contractor shall follow all specified and manufacturer's instructions and conditions for installation of all products and finishes.

D. 3.5 Warranty

1. Add the following §§ 3.5.3 and 3.5.4 to § 3.5:

§ 3.5.3 The warranty provided in this paragraph shall be in addition to and not in limitation of any other warranty or remedy required by law or by the Contract Documents.

§ 3.5.4 The Contractor shall provide the Owner with written warranties covering the work for the periods of time specified in the Contract Documents. As a minimum the work will be guaranteed against defects in materials and workmanship for one year from the date of final acceptance of the project by the Owner with all mechanical equipment compressors guaranteed for five years from the date of final acceptance. The date of final acceptance shall be the beginning date of all warranties (see Article 8).

E. 3.7 Permits, Fees, Notices and Compliance with Laws

1. Delete § 3.7.2 and substitute the following:

§ 3.7.2 The Contractor shall comply with required applicable laws, statutes, ordinances, codes, rules and regulation, and lawful orders of public authorities, applicable to performance of the Work. Contractor shall be responsible for notifying appropriate government agencies of the Contractor's need for inspections to meet required applicable laws, statutes, ordinances, codes, rules and regulation, and lawful orders of public authorities. The Contractor shall obtain from the appropriate government agencies a list of all systems and materials required to be inspected for occupancy.

2. Add the following § 3.7.6 to § 3.7:

§ 3.7.6 The Contractor shall meet the latest requirements of the United States Department of Labor Occupational Safety and Health Standards and comply with The Manual of Accident Prevention in Construction, all applicable safety and sanitary laws, regulations, and ordinances and any safety rules or procedures.

F. 3.9 Superintendent

1. Delete § 3.9.1 and substitute the following:

§ 3.9.1 The Contractor shall employ and keep at the site of the work during its progress a competent and thoroughly experienced superintendent capable of handling all phases of the project. The Superintendent shall have any necessary assistants, foremen and timekeepers required by the scope of this project, and shall be acceptable to the Architect, and shall not be changed or transferred unless approved by the Architect or ceases to be in the employ of the Contractor. If the Contractor must replace the Superintendent for any reason between "Notice-to-Proceed" and final Architect's certification of completion of the work, then the Contractor shall notify Architect that the existing Superintendent will be leaving the job on a specific date 7 days prior to and that all job work shall cease after said date until a satisfactory replacement Superintendent is found, acceptable to the Architect, and physically present on the site, properly authorized and briefed by Contractor on the status of the project.

2. Add the following §§ 3.9.4, 3.9.5, 3.9.6, 3.9.7 to § 3.9:

§ 3.9.4 The Superintendent shall represent the Contractor in the Contractor's absence and all directions given to the Superintendent shall be binding as if given to the Contractor. Major and important directions shall be confirmed in writing to the Contractor. Other directions shall be so confirmed on written request in each case.

§ 3.9.5 The Contractor shall submit to the Architect the name of the proposed superintendent for the Contractor at the Pre-Construction Conference for the Architect's review and acceptance. The contractor shall provide the proposed superintendent's work experience resume that includes similar size and type projects. The superintendent shall attend the Pre-Construction Conference and all Progress Meetings.

§ 3.9.6 The Superintendent will remain on the job until punch list items are corrected, no exception.

§ 3.9.7 The Contractor shall give efficient supervision to the work, using the best skill and attention. The Contractor shall carefully study and compare all drawings, specifications and other instructions and shall report at once to the Architect any error, inconsistency or omission which is discovered but shall not be held responsible for their existence or discovery. The Superintendent shall be in attendance on the job a minimum of six (6) hours per working day from "Notice to Proceed" continuously through final approval of the work by the Architect. No work shall be allowed to transpire on the site unless the Superintendent is in attendance at the site.

G. 3.10 Contractor's Construction and Submittal Schedules

1. Add the following § 3.10.4 to § 3.10:

§ 3.10.4 The contractor shall furnish, not later than 7 days of date established for commencement of work, a bar-chart schedule showing the expected times of completion of the various stages of work on this project. The work headings therein shall correspond generally with the headings listed in the Contractor's Schedule of Values. During progress of the work the Contractor shall enter on the schedule the actual progress at the end of each month, and shall deliver two (2) copies to the Architect along with the Contractor's pay request. Contractor's pay request will not be processed until receipt and review of monthly updated bar-chart schedule.

H. 3.11 Documents and Samples at the Site

1. Add the following to § 3.11:

Insert the Section designator '**§ 3.11.1**' at the beginning of the existing paragraph.

2. Add the following § 3.11.2 to § 3.11:

§ 3.11.2 Copy of Toxic Substance List submitted by both the Contractor and Subcontractors to the Owner, must be kept at the site during the duration of construction.

I. 3.12 Shop Drawings, Product Data and Samples

1. Add the following §§ 3.12.11, 3.12.12 and 3.12.13 to § 3.12:

§ 3.12.11 Shop Drawings and samples shall be dated and contain the following: name of project; project number; description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed. If the shop drawings do not conform completely to the requirements of the Contract Documents, such nonconformance shall be specifically noted on the face of the drawings. Refer to Division 1 Section "Submittal Procedures."

§ 3.12.12 Submission of Shop Drawings and samples shall be accompanied by transmittal letter, containing project name, Contractor's name, number of drawings and samples, titles and other pertinent data.

§ 3.12.13 Unless otherwise specified, the number of Shop Drawings and the number of Samples which the Contractor shall submit and, if necessary, resubmit, is the number that the Contractor requires to be retained for the Contractor's use plus 2, which will be retained by the Architect/Engineer.

J. 3.13 Use of Site

1. Add the following to § 3.13:

Insert the Section designator '**§ 3.13.1**' at the beginning of the existing paragraph.

2. Add the following § 3.13.2 to § 3.13:

§ 3.13.2 Contractor shall access the Project site from roadways, rights-of-way, easements or temporary roadways as authorized by the Owner and shall limit construction traffic from residential areas by utilizing through streets within commercial districts. Use of multiple project site access points shall be at the discretion of the Owner. The Contractor shall present a plan, for approval by the Architect and Owner, showing all areas for safety fencing staging, storage, job office, ingress and egress to the site. No work shall be done until this is approved

3.15 Cleaning Up

3. Add the following § 3.15.3 to § 3.15:

§ 3.15.3 The Contractor shall keep interior of the building clean on a daily basis and keep the area around the building free of stored or unattended combustible materials.

2.4 ARTICLE 5: SUBCONTRACTORS

A. 5.3 Subcontractural Relations

1. Add the following to § 5.3:

Insert the Section designator '**§ 5.3.1**' at the beginning of the existing paragraph.

2. Add the following § 5.3.2 to § 5.3:

§ 5.3.2 The Subcontractor agrees, to the fullest extent permitted by law, to indemnify, hold harmless and defend the Contractor, Owner, Architect, Architect's consultants, their respective agents, and employees of any of them harmless from any liability for damages to any person or property upon, or at, or about the project, that may arise as a result of or in connection with the work hereunder, provided, however, that the Subcontractor shall not be required to indemnify the Contractor against the Contractor's sole negligence; and the Subcontractor agrees to procure at his own expense, before the commencement of the work comprehensive general liability including contractor's protective liability insurance, completed operations and contractual liability insurance and automobile liability insurance, including the ownership, maintenance, and operation of any automotive equipment owned, hired and non-owned for the benefit of the Contractor and Owner, in the sum of Two Hundred Fifty Thousand ($250,000.00) Dollars for damages resulting to one person and Five Hundred Thousand ($500,000.00) Dollars for damages to persons resulting from one casualty, and Two Hundred Fifty Thousand ($250,000.00) Dollars for damages to property arising out of each casualty, and an aggregate of not less than Five Hundred Thousand ($500,000.00) Dollars for damages to property, and to keep such insurance in force until the construction of the project is fully completed, and to immediately and before commencing work deliver such policy or policies or certificates of such insurance to the Contractor. Provided however, that in the event Exhibit 1 to the Contract for Construction (Insurance Provisions) conflicts, Exhibit 1 shall control.

2.5 ARTICLE 7: CHANGES IN THE WORK

A. 7.2 Change Orders

1. Add the following §§ 7.2.2, 7.2.3, 7.2.4, 7.2.5, and 7.2.6 to § 7.2:

§ 7.2.2 The Contractor is responsible for all affected work that is a result of a Change Order. All changes required as a result of a Change Order should be reflected in the price of the Change Order. Any associated additional work that becomes evident after the Change Order has been signed will be made at the Contractor's expense.

§ 7.2.3 When any one change increases or decreases the scope of the original contract, the proposal to change shall be supported by accurate cost data establishing the fair and current market value of the labor, materials, equipment, and incidentals required to accomplish the change, plus a margin to represent the contractor's profit and overhead. Cost data shall be in sufficient detail to enable the Architect or Engineer to confirm the accuracy of such proposal. Profit and overhead shall be added to additive change orders and shall be deducted on deductive change orders. No deduction shall be made for profit and overhead on deductive change orders in connection with Direct Material Purchases.

§ 7.2.4 Cost shall be limited to the following: Cost of materials, including sales tax and cost of delivery, cost of labor, including Social Security, Old Age and Unemployment Insurance; Worker's Compensation Insurance; rental value of power tools and equipment. Overhead shall include the following: Bond premiums, supervision, superintendence, wages of timekeepers, watchmen and clerks, small tools, incidentals, general office expense and all other expenses not included in "cost." If the net value of a change results in a credit from the Contractor or Subcontractor, the credit given shall be the net cost plus overhead and profit except for Direct Material Purchase items.

§ 7.2.5 The Contractor shall not be entitled to any claim for damages or cost including loss of profits, loss of use, overhead expenses, equipment rental, etc. on account of hindrances or delays from any cause whatsoever. If the hindrance or delay is caused by any act of God, or by any act or omission on the part of the Owner, Owner's agents, or governmental agencies having jurisdiction, such act, hindrance, or delay may entitle the Contractor to an extension of time only in which to complete the work which shall be determined by the Architect and approved by the Owner, provided that the Contractor will give written notice as provided herein of the cause of such act, hindrance, or delay.

§ 7.2.6 Should concealed conditions encountered in the performance of the work below the surface of the ground be at variance with the conditions indicated by the Contract Documents, the Contract Sum shall be equitably adjusted by Change Order upon claim by either party made within (5) five days after the first observance of the conditions.

2.6 ARTICLE 8: TIME

A. 8.2 Progress and Completion

1. Add the following §§ 8.2.4 and 8.2.5 to § 8.2:

§ 8.2.4 The work to be performed under the Contractor's Base Proposal as defined in the Contract Documents shall be substantially completed as defined per signed contract between Owner and Contractor.

§ 8.2.5 Failure to complete the Project within the time fixed in this Agreement will result in substantial injury to the Owner, and as damages arising from such failure cannot be calculated with any degree of certainty, according to the definition of " Substantial Completion" in § 9.8.1 of the General Conditions, within the time fixed or within such further time, if any, as may be authorized in accordance with Contract Documents, the Contractor shall pay to the Owner as Liquidated Damages for such delay, and not as a penalty, $500.00 for each and every calendar day elapsing between the date fixed for Substantial Completion and the date such Substantial Completion shall be fully accomplished. It is also hereby agreed that if after sixty (60) Calendar days after Substantial Completion this Project is not fully and finally completed in accordance with the requirements of the Contract Documents, the Contractor shall pay to the Owner as Liquidated Damages, and not as a penalty, for such delay, 1/2 of the rate previously indicated. These Liquidated Damages shall be payable in addition to any expenses or costs payable by the Contractor to the Owner under the provision of the Contract Documents and shall not exclude the recovery of damages of the Owner under the Contract Documents. This provision of Liquidated Damages for delay shall in no manner affect the Owner's right to terminate the Contract. The Owner's exercise of the right to terminate shall not release the Contactor from his obligation to pay Liquidated Damages. It is further agreed that the Owner may deduct from the balance of the Contract Sum held by the Owner the Liquidated Damages stipulated herein or such portions, as said balance will cover.

B. 8.3 Delays and Extensions of Time

1. Add the following to the end of § 8.3.2:

   Extension of time requests due to adverse weather, shall be submitted within twenty (20) days after adverse weather and in accordance with the applicable provisions of Article 15 of the General Conditions. The Contractor shall submit the referenced climatologically summary data immediately upon its availability and shall show how the time extension request corresponds with the climatological data. Extension of contract time due to adverse weather shall be for "time only" and will not be the basis of any monetary claim or request for "extended general conditions." Refer to Section 00 73 80 "Weather Delay Log."

2. Add the following §§ 8.3.4, 8.3.5, 8.3.6, 8.3.7, 8.3.8, 8.3.9 and 8.3.10 to § 8.3:

   § 8.3.4 The Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine and as approved by the Owner.

   § 8.3.5 All Claims for extension of time shall be made in writing to the Architect no more than seven (7) days after the Occurrence of the delay except for weather delays which are governed by 8.3.2; otherwise they shall be waived. In the case of a continuing delay only one claim is necessary.

§ 8.3.6 It is mutually agreed between the parties that time is of the essence of this contract, and that there will be, on the part of the Owner considerable monetary damage in the event the work is not completed within the time fixed for completion in the Contract or within the time to which such completion may have been extended.

§ 8.3.7 The amount per calendar day set forth herein for each day that said Contract is not completed is hereby agreed upon as the liquidated damages for each and every calendar day that the time consumed in completing the work under the contract exceeds that time allowed therefore.

§ 8.3.8 The amount shall, in no event, be considered as a penalty or otherwise than as liquidated and adjusted damages to the Owner of the said Project, and the Contractor and his sureties shall be liable therefore.

§ 8.3.9 The Contractor agrees to make no claim for damages for delay in the performance of the contract occasioned by any act or omission of the Owner or any of its agents or representatives, or because of any injunction which may be brought against the Owner and agrees that any such claim shall be fully compensated for by an extension of time to complete performance of the Work as provided herein.

§ 8.3.10 No extension of time beyond the date of completion fixed by terms of the Contract shall be effective unless in writing, submitted to the Architect, and approved by Owner. The determination made by the Owner on an application for an extension of time shall be binding and conclusive on the Contractor.

2.7 ARTICLE 9: PAYMENTS AND COMPLETION

A. 9.3 Applications for Payment

1. Add the following § 9.3.1.3 to § 9.3.1:

§ 9.3.1.3 The full Contract retainage may be reinstated if the manner of completion of the Work and its progress do not remain satisfactory to the Architect (or if the Surety withholds its consent), or for other good and sufficient reasons.

B. 9.4 Certificates for Payment

1. Add the following §§ 9.4.3, 9.4.4, and 9.4.5 to § 9.4:

§ 9.4.3 The Architect shall certify a payment of ninety percent (90%) of the value of the Work and materials as above noted according to his best judgment of the correct amount.

§ 9.4.4 On these monthly certificates, ten percent (10%) of the total of the estimated work for that month shall be retained until completion and acceptance of the job.

§ 9.4.5 Upon substantial completion of the job, the Architect may issue a semi-final certificate covering payment up to ninety percent (90%) of the Contract Sum less any reserves to cover any incomplete items.

C. 9.7 Failure of Payment

1. Add the following to § 9.7:

   Insert the Section designator '**§ 9.7.1**' at the beginning of the existing paragraph.

2. Add the following § 9.7.2 to § 9.7:

   § 9.7.2 Payments to Subcontractors

   § 9.7.2.1 If the Architect fails to issue a Certificate for Payment for any cause which is the fault of the Contractor and not the fault of a particular Subcontractor, the Contractor shall pay that Subcontractor on demand, made at any time after the Certificate for Payment should otherwise have been issued for his work to the extent completed, less the retained percentage.

   § 9.7.2.2 The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor under Article 11, and he shall require each Subcontractor to make payments to his subcontractors.

   § 9.7.2.3 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.

   § 9.7.2.4 Neither the Owner nor the Architect shall have any obligation to pay or to see the payments of any moneys to any Subcontractor except as may otherwise be required by applicable laws and statutes. Payment to material suppliers shall be treated in a manner similar to that provided in Subparagraphs 9.7.2.1, 9.7.2.2, and 9.7.2.3.

2.8 ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

A. 10.4 Emergencies

1. Add the following § 10.4.1 to § 10.4:

   § 10.4.1 The Contractor shall provide at the site, and make available to all workers, medical supplies and equipment necessary to supply first aid service to all persons injured in connection with the work. The Contractor shall report any and all accidents in writing to Insurance Company, Owner and Architect within twenty-four (24) hours of the occurrence. The report shall contain the following information and it shall be the responsibility of the Contractor to have an accident report filled out in triplicate and submitted as required above with (1) Name of Person or Persons and Home Address, (2) Location of Occurrence, (3) Time of Day and Date, (4) Description of Occurrence, (5) Statements of Witnesses and (6) Signature of Contractor's Superintendent. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone. If any claim is made by anyone against the Contractor or any Subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Owner, giving full details of the Claims.

2.9 ARTICLE 11: INSURANCES AND BONDS

A. 11.1 Contractor's Insurance and Bonds

1. Delete § 11.1.1 and substitute the following:

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the State of Florida such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, 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. All insurance policies shall be issued and countersigned by representatives of such companies duly authorized for the State of Florida and shall be written on ISO standard forms or their equivalents. The Contractor shall provide the ISO Commercial General Liability policy for general liability coverage. All liability policies shall provide that the Owner is a named additional insured as to the operations of the Contractor under the Agreement and shall provide for the Severability of Insureds Provision. The Owner shall be exempt from, and in no way liable for, any sums of money, which may represent a deductible in any insurance policy. The payment of such deductible shall be the responsibility solely of the Contractor and/or Subcontractor providing such insurance. The insurance shall protect the Contractor from the following claims, and any other claim not listed:

.1 claims under workers' or workmen compensation, disability benefit and other similar employee benefit acts, which are applicable to the Work to be performed;
.2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
.4 claims for damages insured by usual personal injury liability coverage including claims, which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;
.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
.6 claims for damages because of bodily injury, death of a person or property damages arising out of ownership, maintenance or use of a motor vehicle;
.7 claims for bodily injury or property damage arising out of completed operations; and
.8 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

§ 11.1.2 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates and the insurance policies required by § 11.1 shall contain a provision that coverages afforded under the policies will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment an

additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by § 9.10.2. The Contractor shall furnish one copy each of Certificates of Insurance for each copy of the Agreement which shall specifically set forth evidence of all insurance coverage required by the Contract Documents. The Certificate of Insurance shall be dated and show the name of the insured Contractor, the specific job by name and job number, the name of the insurer, the number of the policy, its effective date, and its termination date. The Contractor shall furnish a copy of the insurance policy to the Owner within 60 days following execution of the Agreement. If the Acord form certificate is used, the Supplemental Attachment form, AIA document G715, shall be completed, signed by Contractor's insurance representative and attached to the Acord certificate.

2. Delete § 11.1.2 and substitute the following:

§ 11.1.2 The Contractor shall furnish the Owner a Performance Bond equal to one hundred percent (100%) of the contract price. The Performance Bond shall extend as a guarantee bond for one (1) year after final acceptance of the Work, or until specified guarantees, which exceed one year are satisfied. The Contractor shall furnish a Labor and Material Payment Bond equal to one hundred percent (100%) of the contract price.

3. Add the following § 11.1.5, and its subparagraphs to § 11.1:

§ 11.1.5 The insurance required by § 11.1.1 shall be written for not less than any limits of liability set forth in Attachment A-1, required by Law or set forth in the Contract Documents, whichever is greater. Other types as may be required by the Project Specifications shall also be furnished.

§ 11.1.5.1 FURNISH TO THE OWNER A LETTER FROM THE INSURANCE COMPANY STATING THAT ALL REQUIRED INSURANCE HAS BEEN COMPLIED WITH AS SPECIFIED.

§ 11.1.5.2 THE OWNER, AND THE ARCHITECT, shall be named as an ADDITIONAL INSURED on the Contractor's general liability policies. (Being named as Certificate Holder is not acceptable).

§ 11.1.5.3 INSURANCE MUST BE MAINTAINED FOR ONE (1) YEAR AFTER FINAL PAYMENT if written on a claims-made basis.

§ 11.1.5.4 All insurance shall contain provision that coverage afforded under the policies SHALL NOT BE CANCELED OR MODIFIED UNTIL A MINIMUM OF FIFTEEN (15) DAYS PRIOR WRITTEN NOTICE TO OWNER HAS BEEN GIVEN, AND THIS PROVISION SHALL BE NOTED ON CERTIFICATES OF INSURANCE.

§ 11.1.5.5 Deliver to the Architect, before work commences, two (2) certificates evidencing compliance with all required insurance, using AIA Document G705, Certificate of Insurance.

§ 11.1.5.6 Insurance required shall include Contractual Liability Insurance applicable to the Contractor's obligations under Article 3.

§ 11.1.5.7 Property Insurance coverage shall include coverage of perils of windstorms, fire, lightning vandalism, malicious mischief and those included in extended coverage in the amount of one hundred percent (100%) of the values at risk. Extended coverage, vandalism, and malicious mischief insurance may contain the standard deductibles.

§ 11.1.5.8 Contractor shall maintain valid Worker's Compensation Insurance as required by Chapter 440, Florida Statutes. All Subcontractors shall maintain valid Worker's Compensation as required by Florida Statutes.

§ 11.1.5.9 Contractor shall maintain Public Liability Insurance against bodily injury, personal injury and property damage, in limits as specified. Coverage shall include Comprehensive General Liability and Products and Completed Operations Liability.

§ 11.1.5.10 The amounts set forth herein and by Law shall apply equally or whether on or off the site of the Work.

§ 11.1.5.11 Unless otherwise provided in the Contract Documents, property insurance shall cover portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also portions of the Work in transit

END OF DOCUMENT 00 73 00

DOCUMENT 00 73 80 – **WEATHER DELAY LOG**

A. Project: Martin Luther King Jr. Recreation Center

B. Date:

C. Weather Event:

D. Work On Progress:

E. Is the work on the Critical Path (defined as a task vital to the project completion)?

F. Length of Delay:

G. If the work is not on the Critical Path, how many days of delay until this work category will be on the Critical Path?

H. Instructions:

1. The above information is required to be submitted with each payment request on a monthly basis. The NOA weather report and superintendents daily log must be submitted with weather extension request.
2. This information will be required as back-up to grant a Time Extension request for delays caused by weather events.
3. Direct delays for work stoppages that are on the critical path will be given accordingly.
4. Delays for work not on the critical path shall be logged and delay logs for that category of work shall be accumulated and submitted in the event the work enters the critical path and causes a delay of the project.
5. Delays will be granted only on the basis of adverse effect on the Critical Path of work for the project.

I. References:

J. SECTION 01 33 10 - WEATHER TABLE – See Adverse Weather Days
SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION - Subparagraph 8.3.2:

K. Extension of time requests due to adverse weather shall be submitted within twenty (20) days after adverse weather. The Contractor shall submit the referenced climatologically summary data immediately upon its availability and shall show how the time extension request corresponds with the climatological data. Extension of contract time due to adverse weather shall be for “time only” and will not be the basis of any monetary claim or request for “extended general conditions.”

L. Submitted by:

M. Signature:

N. General Contractor:

SECTION 01 05 00 - FIELD ENGINEERING

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. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:

1. Civil-engineering services.
2. Geotechnical monitoring.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.

1.3 QUALITY ASSURANCE

A. Engineer Qualifications: Engage an engineer of the discipline required, licensed in the state where the Project is located, to perform required engineering services.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

B. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.

C. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

3.2 PERFORMANCE

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level, and plumb.

B. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

C. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.

D. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

END OF SECTION 01 05 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Owner-furnished/Contractor-installed (O/C) products.
4. Contractor's use of site and premises.
5. Specification and Drawing conventions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

A. Project Identification: Martin Luther King Jr. Recreation Center

1. Project Location: 705 14th Court East, Panama City, Florida 32401

B. Owner: City of Panama City, FL

1. Owner's Representative: Saskia Adriance, Panama City PMO Dept.

C. Architect: Cohen Carnaggio Reynolds, Inc.

1. Architect's Representative: Roman Gary, AIA.

1.5 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

This is a federally funded project, and all required federal contract provisions apply.

The Base Bid for this construction project is for a complete project as described in the plans and specifications including all structures and sitework.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (O/C) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

    a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Each Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 20 00 - PROJECT MEETINGS

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 specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preinstallation conferences.
2. Progress meetings.
3. Coordination meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PREINSTALLATION CONFERENCES

A. Conduct a preinstallation conference at the Project Site before each construction activity that requires coordination with other construction. Activities requiring preinstallation conferences include, but are not limited to the following:

1. Fluid-applied Moisture Barrier.
2. Single-Ply Membrane Roofing.
3. Preformed Metal Roofing.
4. Aluminum Entrances & Storefronts.
5. Gypsum Board Assemblies
6. Tile Work.
7. Flooring.
8. Awnings.
9. Residential Appliances.
10. Casework.

B. Attendees: The Owner's representative, installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Architect of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for the following:

    a. Contract Documents.
    b. Shop Drawings, Product Data, and quality-control samples.
    c. Possible conflicts.
    d. Compatibility problems.
    e. Time schedules.
    f. Manufacturer's recommendations.
    g. Compatibility of materials.
    h. Acceptability of substrates.

1.4 PROGRESS MEETINGS

A. Conduct progress meetings at the Project Site at regular intervals. Notify the Owner and the Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

1.5 COORDINATION MEETINGS

A. Conduct project coordination meetings at regular intervals convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special preinstallation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 20 00

SECTION 01 21 00 - ALLOWANCES

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 administrative and procedural requirements governing allowances.

1. Selected materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Modification Procedures" specifies procedures for submitting and handling Change Orders.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise the Architect of the date when the final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At the Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by the Architect from the designated supplier or equal.

1.4 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show the actual quantities of materials delivered to the site for use in fulfillment of each allowance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly upon delivery for damage or defects.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Refer to Section 004321 “Allowance Form” for Lump Sum Allowances.

END OF SECTION 01 21 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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other Work of the Contract.

C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Refer to Section 004323 “Alternates Form” for Schedule of Alternates.

END OF SECTION 01 23 00

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Document 002600 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
2. Section 012100 "Allowances" for products selected under an allowance.
3. Section 012300 "Alternates" for products selected under an alternate.
4. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

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

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use form acceptable to Architect.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

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

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed unless otherwise indicated.

C. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.

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

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation

to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
k. For bidding substitutions do not apply to "or equal" portions in the specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00

SECTION 01 29 00 - APPLICATIONS FOR PAYMENT

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 specifies administrative and procedural requirements governing the Contractor's Applications for Payment.

B. This Section specifies administrative and procedural requirements governing the prime contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts. Two separate Schedule of Values and Applications for Payment (one for Federally Funded Scope of Work, and one for Non-Federally Funded Scope of Work) will be required on a monthly basis.

C. Related Sections: The following Sections contain requirements that relate to this Section.

1. Division 00 43 73 Proposed Schedule of Values Form.

2. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section "Submittals."

1.3 SCHEDULE OF VALUES

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

B. Coordination: The prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Contractors' Construction Schedule.

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

    a. Contractor's Construction Schedule.
    b. Application for Payment forms, including Continuation Sheets.
    c. List of subcontractors.
    d. Schedule of allowances.
    e. Schedule of alternates.
    f. List of products.
    g. List of principal suppliers and fabricators.

2. Submit a completed proposed Schedule of Values form for owner/architect review within fifteen (15) days after the Notice of Intent to Award.

C. Format and Content: Use the Bid Form in Section 00 43 73 as a guide to establish the format for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Provide separate and detailed Schedule of Values for each of the following:

    a. Federally Funded Scope of Work (Refer to Drawing Sheet C-4).
    b. Non-Federally Funded Scope of Work.
    c. Project number.
    d. Contractor's name and address.
    e. Date of submittal.

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

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

3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value.
    h. Percentage of Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum, including alternates, in sufficient detail to facilitate continued evaluation of bid, Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal material and subcontract amounts more than **two** percent of the Contract Sum.

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

6. 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.

7. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. Margins of Cost: Show line items for indirect costs and margins on actual costs only when such items are listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete. Include the total cost and proportionate share of

general overhead and profit margin 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 the Contractor's option.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as reviewed and certified by the Architect and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Each monthly application should include the following:

a. Current construction schedule.
b. Current Change Order Log, showing the status of all Change Orders.
c. Current RFI Log, showing the status of of all RFI's and Change Orders.
d. Current Submittal Log.
e. Lein Wavers from suppliers, vendors and subcontractors.

C. Provide a separate Application for Payment for each of the following:

1. Federally Funded Scope of Work (Refer to Drawing Sheet C-4).

2. Non-Federally Funded Scope of Work.

D. Payment-Application Times: Each progress-payment date is indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

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

F. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

G. Transmittal: Submit 4 signed and notarized original copies of each Application for Payment to the Architect by a method ensuring receipt within 24 hours. One copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate

information related to the application, in a manner acceptable to the Architect.

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

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Contractor's Construction Schedule (preliminary if not final).
5. Schedule of principal products.
6. Schedule of unit prices.
7. Copies of building permits.
8. Initial progress report.
9. Certificates of insurance and insurance policies.
10. Performance and payment bonds.
11. Submittal Schedule.

H. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

2. Administrative actions and submittals that shall precede or coincide with this application include:

   a. Occupancy permits and similar approvals.
   b. Warranties (guarantees) and maintenance agreements.
   c. Test/adjust/balance records.
   d. Maintenance instructions.
   e. Final cleaning.
   f. Application for reduction of retainage and consent of surety.
   g. Advice on shifting insurance coverages.
   h. List of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

J. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Completion of Project closeout requirements.

2. Completion of items specified for completion after Substantial Completion.

3. Ensure that unsettled claims will be settled.

4. Ensure that incomplete Work is not accepted and will be completed without undue delay.

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.
9. Change of door locks to Owner's access.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 29 00

SECTION 01 31 00 – PROJECT MANAGEMENT COORDINATION

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 administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Coordination Drawings.
3. Cleaning and protection.

1.3 COORDINATION

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.
4. Coordinate the work with other Prime Contractors.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. The Contractor shall prepare and submit for the Owner's information and the Architect's approval a Construction Schedule for the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Staff Names:
1. Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.
2. Post copies of the list in the Project meeting room, the temporary field office, and each temporary telephone.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."
4. In particular, prepare coordination drawings for overhead utilities and construction, including: structural framing, mechanical, plumbing, fire protection, electrical lighting, audio visual and information technology, fire alarm and smoke detection, athletic equipment, and security systems. See Divisions 11, 21, 22, 23 26, and 28 for further requirements.

B. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.

h. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

C. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate sub-framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
    d. See Divisions 21, 22 and 23 for more requirements.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
    e. See Divisions 26 and 28 for more requirements.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

    b. See Division 21 for more requirements.

9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's

responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

D. Coordination Drawing Process: Prepare coordination drawings in the following manner:

1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.
6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

1.9 PROJECT MEETINGS

A. General: [Schedule and conduct] [Construction Manager will schedule and conduct] meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of [seven] <Insert number> days prior to meeting.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner[, Construction Manager,] and Architect, within [three] <Insert number> days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Responsibilities and personnel assignments.
      b. Tentative construction schedule.
      c. Phasing.
      d. Critical work sequencing and long lead items.

e. Designation of key personnel and their duties.
f. Lines of communications.
g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Sustainable design requirements.
o. Preparation of Record Documents.
p. Use of the premises.
q. Work restrictions.
r. Working hours.
s. Owner's occupancy requirements.
t. Responsibility for temporary facilities and controls.
u. Procedures for moisture and mold control.
v. Procedures for disruptions and shutdowns.
w. Construction waste management and recycling.
x. Parking availability.
y. Office, work, and storage areas.
z. Equipment deliveries and priorities.
aa. First aid.
bb. Security.
cc. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. 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. Where applicable, such exposures include, but are not limited to, the following:

3. Excessive static or dynamic loading.
4. Excessively high or low temperatures.
5. Thermal shock.
6. Excessively high or low humidity.
7. Water or ice.
8. Puncture.
9. Abrasion.
10. Heavy traffic.
11. Soiling, staining, and corrosion.
12. Rodent and insect infestation.
13. Contact between incompatible materials.
14. Excessive weathering.
15. Unprotected storage.
16. Improper shipping or handling.
17. Theft.
18. Vandalism.

END OF SECTION 01 31 00

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Startup construction schedule.
2. Contractor's Construction Schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

B. Related Requirements:
1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

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 the critical path of Project and when activities can be performed.

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

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Startup construction schedule.

1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Site Condition Reports: Submit at time of discovery of differing conditions.

G. Unusual Event Reports: Submit at time of unusual event.

H. Qualification Data: For scheduling consultant.

1.5 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 Section 013100 " 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 work stages area separations and interim milestones.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting, using CPM scheduling.

1. In-House Option: Owner may waive requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

C. 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.

D. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Temporary Facilities: Indicate start and completion dates for the following as applicable:

a. Securing of approvals and permits required for performance of the Work.
b. Temporary facilities.
c. Construction of mock-ups, prototypes and samples.
d. Owner interfaces and furnishing of items.
e. Interfaces with Separate Contracts.
f. Regulatory agency approvals.
g. Punch list.

2. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
3. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
4. Commissioning Time: Include no fewer than 15 days for commissioning.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and 's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

E. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

a. Uninterruptible services.
b. Partial occupancy before Substantial Completion.
c. Use-of-premises restrictions.
d. Provisions for future construction.

e. Seasonal variations.
f. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Building flush-out.
m. Startup and placement into final use and operation.
n. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

F. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion., and the following interim milestones:

1. Temporary enclosure and space conditioning.

G. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

H. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.

4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

I. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

J. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

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

1. 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.

1.8 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice to Proceed.

1. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.10 CPM SCHEDULE REQUIREMENTS

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

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 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, 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 60 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.

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 for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup 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 inspection.
j. Commissioning.

k. Punch list and Final Completion.
l. Activities occurring following Final Completion.

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. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

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

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main 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).

G. 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.

1.11 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Work Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

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

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 32 00

SECTION 0133 00 – SUBMITTAL PROCEDURES

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 administrative and procedural requirements for submittals required for performance of the Work, including the following:

1. Contractor's construction schedule.
2. Shop Drawings.
3. Product Data.
4. Samples.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 1 Section "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
3. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
4. Division 1 Section "Quality Control" specifies requirements for submittal of inspection and test reports.
5. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay. Submit to the Architect for his approval.

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

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

a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.

    a. Allow 2 weeks for initial review by the Architect. Allow additional time if the Architect must delay processing to permit coordination with subsequent submittals.
    b. If an intermediate submittal is necessary, process the same as the initial submittal.
    c. Allow 2 weeks for reprocessing each submittal.
    d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.

4. A submittal schedule shall be submitted with the first application. Schedule shall illustrate all
Submittals and their time frames.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Include the following information on the label for processing and recording action taken.

    a. Project name.
    b. Date.
    c. Name and address of the Contractor.
    d. Name and address of the subcontractor.
    e. Name and address of the supplier.
    f. Name of the manufacturer.
    g. Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect using a transmittal form. The Architect will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

2. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

    a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

3. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project management software website. Enter required data in web-based software site to fully identify submittal.

4. Paper: Prepare submittals in paper form and deliver to Architect.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 15 days after the date established for "Commencement of the Work." Schedule shall be provided in a Suretrack Format.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values." No activity shall extend beyond 15 days.
2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.
6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Architect's procedures necessary for certification of Substantial Completion.
7. Schedule shall include “Target Bars” illustrating the initial schedule.
8. Provide Schedule on an electronic disk.
9. Schedule shall reflect all milestone dates.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

C. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.5 SHOP DRAWINGS

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. **Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings.** Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.

4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Final Submittal: Submit digital prints; submit 6 prints where required for maintenance manuals. The Architect will retain 1 print and return the remainder.
7. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

C. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

D. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.6 PRODUCT DATA

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:

    a. Manufacturer's printed recommendations.
    b. Compliance with trade association standards.
    c. Compliance with recognized testing agency standards.
    d. Application of testing agency labels and seals.
    e. Notation of dimensions verified by field measurement.
    f. Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

3. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

4. Paper submittals: Submit 4 copies of each required submittal; submit 6 copies where required for maintenance manuals. The Architect will retain one and will return the other marked with action taken and corrections or modifications required.

    a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

5. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.

6. Web-Based Project Management Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.

7. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal forms.
   a. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
   b. Do not permit use of unmarked copies of Product Data in connection with construction.

1.7 SAMPLES

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. Mount or display Samples in the manner to facilitate review of qualities indicated. Prepare Samples to match the Architect's sample. Include the following:

   a. Specification Section number and reference.
   b. Generic description of the Sample.
   c. Sample source.
   d. Product name or name of the manufacturer.
   e. Compliance with recognized standards.
   f. Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

   a. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
   b. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 4 sets. The Architect will return one set marked with the action taken.

4. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.8 ARCHITECT'S ACTION

A. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Architect will stamp each submittal with a uniform, action stamp. The Architect will mark the stamp appropriately to indicate the action taken.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 33 00

SECTION 01 35 00 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
3. Division 1 Section "Applications for Payment" for administrative procedures governing Applications for Payment.
4. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK

A. The Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time, on AIA Form G710, Architect's Supplemental Instructions. Such changes shall be effected by written order issued by the Architect.

1.4 CHANGE ORDER PROPOSAL REQUESTS

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

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

2. Within 5 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Architect for the Owner's review.

a. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c. Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Owner/Architect.

1. Include a statement outlining the 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 Contract Time.
2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.

1.5 ALLOWANCES

A. Allowance Adjustment: For allowance-cost adjustment, base each Change Order Proposal on the difference between the actual purchase amount and the allowance, multiplied by the final measurement of work-in-place. Where applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in the purchase amount only where indicated as part of the allowance.
2. When requested, prepare explanations and documentation to substantiate the margins claimed.
3. Submit substantiation of a change in scope of work claimed in the Change Orders related to unit-cost allowances.
4. The Owner reserves the right to establish the actual quantity of work-in-place by independent quantity survey, measure, or count.

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Architect may issue a Construction Change Directive on AIA Form G714. The Construction Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. The Architect will take appropriate action on Construction Change Directives.

1. The Construction Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES

A. Upon the Owner's approval of a Proposal Request, the Architect will prepare a Change Order, and the Architect will take appropriate action on a Change Order for signatures of the Owner and the Contractor on AIA Form G701.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 35 00

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by the Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

C. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

D. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Architect. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample taking and testing.

k. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01 40 00

SECTION 01 42 00 - REFERENCE STANDARDS AND DEFINITIONS

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 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of 1 previous project similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of

authorities having jurisdiction.

J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

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 the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different but apparently equal to the Architect for a decision before proceeding.

1. 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 the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Inc.'s "Encyclopedia of Associations," which is available in most libraries.

1.4 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for

compliance with standards and regulations bearing on performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution.
2. Temporary electric power and light.
3. Ventilation.
4. Telephone service.
5. Sanitary facilities, including drinking water.
6. Storm and sanitary sewer.

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds.
2. Temporary project identification signs and bulletin boards.
3. Waste disposal services.
4. Rodent and pest control.
5. Construction aids and miscellaneous services and facilities.

D. Security and protection facilities include, but are not limited to, the following:

1. Temporary fire protection.
2. Environmental protection.

1.3 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

A. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Water: Provide potable water approved by local health authorities.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-Volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

C. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

E. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide air-conditioned units on foundations adequate for normal loading.

F. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

G. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
4. Use Charges: Cost or use charges for temporary facilities **are not chargeable to the Owner or Architect**. Neither the Owner or the Architect will accept cost or use charges as a basis of claims for Change Orders.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.

1. Install electric power service underground, except where overhead service must be used.

2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, ac 20 Ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities.

1. At each telephone, post a list of important telephone numbers.

F. Sanitary facilities include temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Provide covered waste containers for used material.

G. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

H. Drinking-Water Facilities: Provide insulated container for water and ice sized to accommodate construction demand of all the contractor’s and subcontractor’s employees.

3.3 SUPPORT FACILITIES INSTALLATION

A. Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project Site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

C. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

1. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.

D. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily.

Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

E. Rodent and Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations."

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, temporary fire-protection facilities, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage 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.
2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, when 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 the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

    a. Replace air filters and clean inside of ductwork and housings.
    b. Replace significantly worn parts and parts subject to unusual operating conditions.
    c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 01 50 00

SECTION 01 56 29 - TREE AND PLANT PROTECTION

PART 1– GENERAL

1.1 SUMMARY

A. Protect and ensure the welfare of all existing trees, shrubs and groundcover indicated on the Drawings to remain within the Contract limits of work as well as within all adjacent areas, including those areas used for access to the construction site. The Contractor shall furnish and supply all equipment and personnel necessary for continued protection of tree and planting areas. Scope to include pruning, protection from physical damage and disease, and irrigation during site work and construction.

B. Demolish and remove existing trees, shrubs and groundcover as indicated on the Drawings, or otherwise as directed by the Owner's Representative.

C. Field inventory and review with the Owner's Representative all trees within the project limits for either: 1) saving and protecting in place; 2) demolition and removal; or (if applicable), 3) transplanting / relocating to other areas as directed by the Owner's Representative.

1.2. RELATED WORK:

A. Section 31 00 00 Earthwork

B. Section 32 80 00 Irrigation

C. Section 32 90 00 Landscaping

1.3 DEFINITIONS

A. "Injury" is defined, without limitation, as any bruising, scarring, tearing, or breaking of roots, branches, or trunk.

B. "Root zone" is defined as the greater of 5 times the diameter of the trunk as a radius or the outermost limits of the tree canopy.

C. "Owner's Representative" is the designated representative of Stanford University.

D. "Landscape Architect (LA) " is a licensed Landscape Architect or a representative as designated by the Owner's Representative.

E. "Certified Arborist " is the Certified Arborist, or other certified Arborist, as designated by the Owner's Representative and acceptable to Stanford.

1.4 QUALITY ASSURANCE

A. General Responsibility: The Contractor shall be directly responsible for protection and welfare of existing trees, shrubs and groundcover within and around the Contract Limits which are noted to remain. This responsibility shall continue throughout the full construction period until the entire Project is completed and accepted by the Owner's Representative and through completion of the guarantee period and shall include but not be limited to providing all barricades as required and providing protection from mechanical damage, soil compaction, pollution from all sources, and disruption of environmental support which would result in the loss of vigor of said plantings. Contractor shall not take any action foreseeably leading to the death of a tree or permanent damage to its health, including but not limited to excessive pruning, cutting, girdling, poisoning, over watering, unauthorized relocation or transportation of a tree, or machine trenching, excavating, altering the grade, or paving within the root zone of a tree. Exceptions deemed necessary shall be done under the guidance and review of a certified arborist and with approval from Stanford.

B. Qualifications of Workmen: Trimming shall be performed only by a certified arborist. Not more than 1/3 of the foliage of a tree shall be removed in a 12-month period. Provide at least one person approved by the Owner's Representative who shall be present at all times during tree protection and trimming operations, who shall be thoroughly familiar with the type of work involved, and who shall direct all protection and trimming work.

C. Reference Standards: Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to work of this Section.

1. International Society of Arboriculture (ISA) "Guide for Establishing Values of Trees and Other Plants", prepared by the Council of Tree and Landscape Appraisers (CTLA).
2. "Cabling, Bracing and Guying Standards for Shade Trees", as published by the National Arborist Association (NAA), 174 RT 101, Bedford, New Hampshire, 03102.

1.5 SUBMITTALS

A. Schedule: Watering schedule, where interruption of irrigation systems will exceed one watering period.

B. Tree Protection and Demolition Plan: Plan showing all trees over 3 in caliper existing on site and significant shrubs, with indications of which are to be removed and which are to remain as part of the future permanent landscape. Tree protection fencing to be included on this and construction logistics plan. This sheet to be included in field set of drawings, to be on site for reference at all times during construction.

C. Photo documentation of existing plants. Include minimum of 3 photos of each tree to be protected, with the photos taken from different vantage points, to clearly describe the size, form, character and condition of the tree. Include a person or legible measuring rod in each photo for scale reference.

Label each photo with tree ID number and tree species. Label Tree ID number on the submitted Tree Protection Plan.

1.6 JOB CONDITIONS AND CONSTRUCTION REQUIREMENTS

A. Prior to performing any work of this Contract, Contractor shall call for a site meeting with Owner's Representative, Landscape Architect and certified arborist. This meeting shall occur prior to construction of any nature on site. The Purpose of the meeting shall be to establish the conditions and methods for preserving all existing trees and the plant materials to be saved. The site shall be photographed to document the condition of the project area and surrounding site, including laydown area and trailer area, to document existing landscape plantings and irrigation systems. These photographs shall become the basis for future evaluation should damage occur to the landscape planting and irrigation system during the construction. An arborist report shall also be done and be on file prior to construction.

B. Sequencing Schedule: Coordinate and cooperate with other trades to enable the work to proceed as rapidly and efficiently as possible. Protective fencing shall be in place before any other work is begun on site, including materials delivery and storage.

1.7 WARRANTY

A. Contractor shall warrant that all trees, shrubs and groundcover covered by the provisions of this Section will be healthy and in flourishing condition of active growth 1 year from the date of Substantial Completion for shrubs and groundcover and 2 years for trees. Where there has been evidence of neglect or violation of tree protection, the warranty shall extend for 5 years.

B. During the warranty period the Contractor shall be liable for damages to all trees covered by the provisions of this Section and shall pay compensation to the Owner. If a tree to remain is destroyed, or damaged so that in the judgment of the Owner s Representative or the Owner it should be replaced, it shall be removed at Contractor s expense and shall closely match size, color, and variety of damaged plantings. If replacement plant materials are not available or desired by Stanford, liquidated damages will be assessed at the value of the tree as determined by ISA formula.

C. Shrubs and groundcover shall be replaced in kind and shall match sizes removed or otherwise agreed upon by the Owner's Representative.

D. Contractor will not be held responsible for failures due to neglect by the Owner, vandalism, etc., during the warranty period only if such conditions are reported immediately to the Owner's Representative and the damage is documented.

PART 2 – PRODUCTS

2.1 PROTECTIVE FENCING

A. Orange copolymer safety fence, minimum 5 feet height, supported by vertical posts 2 feet into the ground and spaced maximum 10 ft. apart.

1. Include access gate.

2. Include signage permanently attached to fence. Sign to include words: "Warning: this fence shall not be removed without the expressed permission of Project Landscape Architect."

2.2 WATER

A. Water: Provide ample water supply of potable quality and sufficient quantity for all operations required under this Section.

PART 3 – EXECUTION

3.1 TREE PROTECTION FENCING AND TRUNK WRAPPING

A. All trees to be preserved shall be protected with a semi-permanent chain link fence with limited access for tree maintenance. The fences shall enclose the entire area under the root zone of the trees. The fences shall be erected before construction begins and shall remain in place until final inspection of the construction project, when removal is authorized by the Owner's Representative.

B. Install tree protection fencing around trees to preserve existing root zone conditions, approximately 5 feet beyond the tree drip line.

C. During the course of construction, if relocation of the fence is required to facilitate construction, the Contractor shall do so only under direction of the Certified Arborist or Owner's Representative, at no additional expense to the Owner.

D. Trunk Wrapping: If trees are in a small or confined area and cannot be fenced beyond the drip line, then the tree trunk must be wrapped with burlap or orange plastic fencing 2-inches thick from the ground to the first branch and held in place with 2 by 4-inch-thick wooden slats and bound securely with additional orange plastic fencing. These items shall not be allowed to dig into the bark. Caution must be used not to damage any branches. In addition to the trunk, major scaffold limbs may require the same protective treatment as the above if directed by the Arborist or Owner's Representative.

3.2 PROTECTION OF TREES AND SHRUBS

A. During the course of construction, the Contractor shall take all necessary precautions, as outlined herein, to protect from stress, injury or death all existing trees, shrubs and groundcovers to be preserved. Protection shall be given to the roots, trunk, and foliage of all existing plant materials to remain.

B. Trees, subject to the provisions of this Section, which have been injured shall be repaired immediately by an approved, certified arborist. Repair shall include but not be limited to removal of rough edges and sprung bark, severely injured branches and aeration of the root zone of trees where compaction has occurred as directed by Owner's Representative. All costs associated with mitigation of damage to trees to be paid by contractor.

C. Tree protection fencing for trees to remain shall be installed prior to beginning any site work. No construction, demolition, equipment access, or work of any nature will be allowed within the fenced area without prior written approval by Owner's Representative.

1. Approval by Owner's Representative/Certified Arborist for work within the fenced area shall not release the Contractor from any of the provisions specified herein for the protection of existing trees to be preserved.

2. During the course of construction of approved work within the fenced area, no roots larger than two inch in diameter shall be cut without prior written approval by Owner's Representative/Certified Arborist.

D. During construction the existing site surface drainage patterns shall not be altered within the area of the root zone.

E. Contractor shall not alter the existing water table within area of root zone.

F. Take necessary measures, to maintain healthy living conditions for existing trees, shrubs and groundcover to be preserved. Such measures shall include but not be limited to periodic washing of leaves for the removal of dust, soil aeration and supplemental or interim irrigation.

G. Where traffic is necessary and approved by LA, the root zone shall be tested for compaction and corrective measures shall be taken following necessary construction activities. Two to three inches of mulch shall be laid down prior to traffic to reduce potential compaction.

H. Do not permit the following within root zone of any existing tree to be preserved, or on existing or new lawn areas and groundcover areas.

1. Storage or parking of automobiles or other vehicles.

2. Stockpiling of building materials, soils, or refuse of excavated materials.

3. Skinning or bruising of bark.

4. Use of trees as support posts, power poles, or signposts; anchorage for ropes, guy wires, or power lines; or other similar functions.

5. Dumping of poisonous materials on or around trees and roots. Such materials include but are not limited to paint, petroleum products, dirty water, or other deleterious materials.

6. Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approval by Owner's Representative.

7. Damage to trunk, limbs, or foliage caused by maneuvering vehicles or stacking material or equipment too close to the tree.

8. Compaction of shrub areas or tree root zone by excessive foot traffic, movement of trucks or grading machines; storage of equipment, gravel, earth fill, or construction supplies; etc.

9. Excessive water or heat from equipment, utility line construction, or burning of trash under or near bushes or trees.

10. Damage to root system from flooding, erosion, puddling or continuous running water, and excessive wetting and drying resulting from dewatering and other operations.

11. "Excessive pruning", removal of more than one-third (1/3) of the foliage of a tree in any twelve (12) month period.

I. Excavation Around Trees and Shrubs: A Certified Arborist must be present for all (except boring more than 6 feet under grade) trenching or grading occurring within 10 feet from trunks of any redwood trees.

J. When boring occurs more than 6 feet under grade, a Stanford Grounds Services Certified Arborist must be present.

1. Excavation within root zone of trees shall be done only where absolutely necessary.

2. Where trenching for utilities is required within root zone, tunneling under and around roots shall be by hand digging. Main lateral roots and taproots shall not be cut. Smaller roots that interfere with installation of new work may be cut with prior approval.

3. Where excavation for new construction is required within root zone of trees, hand excavation shall be employed to minimize damage to root system. Existing grade of tree at its crown shall be marked with non-toxic paint before construction begins. Roots shall be relocated in backfill areas wherever possible. If 3 or larger roots are encountered, they shall be exposed beyond excavation limits as required to bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation

is not practical, roots shall be hand pruned under direction and approval of a Certified Arborist 6" back from new construction and treated as exposed roots.

4. Exposed, cut or broken roots shall not be allowed to dry out before permanent backfill is placed. Temporary earth cover shall be provided, or roots shall be packed with wet peat moss or four layers of wet, untreated burlap and temporarily supported and protected from damage until permanently relocated and covered with backfill. The cover over the roots shall be wetted to the point of runoff daily.

5. Branching structure shall be thinned in accordance with NAA "Pruning Standards and Practices" to balance loss to root system caused by damage or cutting of root system. Thinning shall not exceed 30 percent of existing branching structure.

6. Boring and/or directional boring is the preferred method of trenching within the driplines of any redwood trees over 14 inches in trunk diameter.

3.3 TREE REMOVAL

A. Dead and damaged trees that are determined by Owner's Representative/Certified Arborist to be incapable of restoration to normal growth pattern shall be removed.

B. Trees designated for removal shall be removed to a point at least 1 foot below the lowest level of subgrade upon which fill will be placed.

C. Soil within a radius of 10 feet of the removed tree under paved area shall receive soil sterilization before further preparation of the subgrade.

3.4 TRIMMING OF TREES

A. In company with the Owner's Representative and Certified Arborist, ascertain the limbs and roots which are to be trimmed and clearly mark them to designate the approved point of cutting.

B. A Consulting Arborist, registered by the American Society of Consulting Arborists (ASCA), shall be engaged to direct removal of branches from trees and large bushes which are to remain if required to clear for new construction.

C. Cut limbs evenly, using proper tools and skilled workmen, to achieve neat severance with the least possible damage to the trees.

D. In the case of root cuts, apply wet burlap or other protection, approved as noted herein, to prevent drying out, and maintain in a wet condition as long as necessary for temporary protection.

3.5 REPAIR COMPENSATION

A. Damage to existing tree crowns or roots over 2 inches in diameter shall be immediately reported to the Owner's Representative in writing, and at the direction of the Owner's Representative/Certified Arborist, repaired immediately at the Contractor's expense by an approved, certified arborist.

B. A Certified Arborist shall direct repair of trees damaged by construction operations. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees.

C. Any tree to remain which is damaged or destroyed owing to the Contractor's negligence or failure to provide adequate protection shall be compensated for dependent on its caliper and in accordance with the schedule of values most current to ISA guidelines, but not less than:

7	$3,000
8	$3,500
9	$4,000
10	$5,000
11	$6,000
12	$8,000
13	$9,000
14	$10,000
15	$11,000
16	$12,000
17	$13,000
18	and over add$ 2,000 for each caliper inch

D. Damaged tree limbs or trees which have died as a result of injury during construction shall remain the property of the Owner and shall remain or be removed by the Contractor as directed by the Owner's Representative.

3.6 MAINTENANCE

A. During construction: Contractor to monitor and perform maintenance activities as required by Landscape Architect or Arborist to ensure that all trees and shrubs to remain are not negatively impacted by construction procedures, throughout the duration of the construction project. This may include, but not be limited to deep watering and or installation of temporary irrigation. Quantities of water to be applied and lengths of time are variable and shall depend upon seasonal rainfall. Throughout the duration of the project, as deemed necessary by the Owner's Representative or Arborist, tree leaves/needles shall be washed down with a hose and water or other means necessary to remove accumulated construction dirt and residues.

B. Maintenance period of 1 year after final acceptance shall apply to shrubs and a minimum of 2 years to trees, as determined by LA. Contractor shall initiate quarterly inspections by a Certified Arborist of existing trees to be preserved and submit written proposals to the Owner's Representative for additional maintenance work as may be required to ensure the health and general well-being of the trees. Contractor shall retain, at the direction of the

Owner's Representative/Certified Arborist additional specialists as may be required to perform this work.

3.7 CLEAN-UP

A. At close of construction in each area, remove all protective barriers and any accumulated debris at the direction of the Owner's Representative. Transport all barrier materials off site at no additional expense to Owner.

B. Repair all grades and areas of soil compaction, and restore all damaged plant materials.

END OF SECTION 01 56 29

SECTION 01 58 13 – PROJECT SIGN REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Project identification sign.

1.2 SUBMITTALS

A. See Section 01 33 00 - Submittal Procedures for administrative and procedural requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.1 PROJECT IDENTIFICATION SIGN

A. One painted sign of construction, design, and content shown on attached Appendix B - Project Sign Drawing.

PART 3 EXECUTION

3.1 INSTALLATION

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

B. Erect at location designated by Architect and Owner.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

3.2 MAINTENANCE

A. Maintain sign and supports. Clean, repair deterioration and damage.

END OF SECTION 01 58 13

"YOUR TAX DOLLARS AT WORK"
MLK RECREATION CENTER

CITY OF PANAMA CITY
501 HARRISON AVENUE
PANAMA CITY, FL 32401

Jenna Flint Haligas, Ward I
Janice Lucas, Ward II
Brian Grainger, Ward III
Josh Street, Ward IV
Michael Rohan, Sr., Mayor
Brandy Waldron, City Manager
Jared Jones, Assistant City Manager

"Project is Funded by FEMA
Public Assistance Grant"

ARCHITECT: CCR Architecture & Interiors
2920 First Avenue South
Birmingham, Alabama 35233
(205) 324-8864
Tammy Cohen, Architect of Record

CONTRACTOR:

SIGN DIMENSIONS: 1200mm X 2400mm X 19mm (approx. 4' x 8' x ¾")
PLYWOOD (APA RATED A-B GRADE - EXTERIOR), PVC TYPE BOARD, OR METAL.
MOUNT ON 4" X 4" X 12' PRESSURE TREATED POSTS
SIGN DESIGN SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO ORDERING
CONTRACTOR MAY SUBMIT SHOP DRAWINGS FOR AN ALTERNATE SIGN MATERIAL FOR ENGINEER
APPROVAL THE SIGN SHALL BE PLACED ON THE SITE AT A LOCATION DESIGNATED BY THE ARCHITECT.
ENGINEER TO DIRECT CONTRACTOR ON LOCATION PLACEMENT.

SECTION 01 60 00 - MATERIALS AND EQUIPMENT

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 administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

    a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

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

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where specification sections name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.

2. Semi-proprietary Specification Requirements: Where specifications sections name 2 or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.

    a. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.

4. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

    a. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.

5. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

6. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

    1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00

SECTION 01 63 10 - SUBSTITUTIONS

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 administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 1 Section "Materials and Equipment" specifies requirements governing the Contractor's selection of products and product options.

1.3 DEFINITIONS

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor ***after award of the Contract are considered to be requests for substitutions.*** The following are not considered to be requests for substitutions:

1. Substitutions requested during the bidding or pricing period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
2. Revisions to the Contract Documents requested by the Owner or Architect.
3. Specified options of products and construction methods included in the Contract Documents.
4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

A. Substitution Request Submittal: The Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Architect.

1. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors, that will be necessary to accommodate the proposed substitution.
b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures.
d. Samples, where applicable or requested.
e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
f. Cost information, including a proposal of the net change, if any in the Contract Sum.
g. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
h. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

2. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.

a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.
2. Proposed changes are in keeping with the general intent of the Contract Documents.
3. The request is timely, fully documented, and properly submitted.
4. The specified product or method of construction cannot be provided within the Contract Time. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
5. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.
6. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner

must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.

7. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
9. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.

B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 63 10

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner's portion of the Work.
6. Coordination of Owner-installed products.
7. Progress cleaning.
8. Starting and adjusting.
9. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished products and limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
4. Section 078410 "Through Firestop Systems" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.

1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

a. Owner's representative.
b. Contractor's superintendent.
c. Trade supervisor responsible for cutting operations.
d. Trade supervisor(s) responsible for patching of each type of substrate.
e. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.

2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Layout Conference: Conduct conference at Project site .

1. Prior to establishing layout of new perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and dimension requirements. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

a. Contractor's superintendent.
b. Professional surveyor responsible for performing Project surveying and layout.
c. Professional surveyor responsible for performing site survey serving as basis for Project design.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.

5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.6 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Professional Engineer Qualifications: Refer to Section 014000 "Quality Requirements."

C. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Conveying systems.
    k. Electrical wiring systems.
    l. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.

B. Engage a land surveyor professional engineer experienced in laying out the Work, using the following accepted surveying practices:

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces, unless otherwise indicated on Drawings.

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

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

J. Repair or remove and replace damaged, defective, or nonconforming Work.

1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

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

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

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.

1. Provide temporary facilities required for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.
2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

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

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

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

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

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

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

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

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

END OF SECTION 01 73 00

SECTION 01 74 00 - WARRANTIES

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 administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
2. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.3 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available

under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.4 SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.

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

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.

D. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the 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 the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 74 00

SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

    a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    b. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Submit record drawings, maintenance manuals, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems and instruction of the Owner's operation and

maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
9. Complete final cleanup requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of a request for inspection, the Architect will either proceed with inspection or advise the Contractor of unfilled requirements. The Architect will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Architect will repeat inspection when requested and assured that the Work is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Before requesting final inspection for certification of final acceptance and final payment, complete the following.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
3. Submit consent of surety to final payment.
4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: The Architect will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Architect.

1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance. If the Work is incomplete, the Architect will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
2. If necessary, reinspection will be repeated.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

C. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

D. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

E. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.

F. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction. Regular site cleaning is included in Division 1 Section "Temporary Facilities and Controls."

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

a. Remove labels that are not permanent labels.
b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
e. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests.

D. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

E. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

END OF SECTION 01 77 00

SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Commissioning. Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. Ideally, this is achieved by beginning in the design phase and documenting design intent and continuing through construction, acceptance and the warranty period with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.

Commissioning activities during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1) Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing contractors.
2) Verify and document proper functional performance of equipment and systems.
3) Verify on-going proper performance persistence of systems under changing conditions throughout the first year of operation.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to respectively design, provide, and install a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in the *Specifications* and in the *Commissioning Plan*. Definitions are found in Section 1.6.

A/E-	Architect and design engineers (Sub to the General Contractor)	FT-	Functional performance test
CA-	Commissioning authority	MC-	Mechanical contractor
CC-	Controls contractor	PC-	Prefunctional checklist
Cx-	Commissioning	PM-	Project manager (of the Owner)
Cx Plan-	Commissioning Plan document	Subs-	Subcontractors to GC
GC-	General Contractor	TAB-	Test and balance contractor
EC-	Electrical contractor		

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning Authority (CA), the owner's Project Manager (PM), the Mechanical Engineer (ME), the designated representative of the General Contractor (GC), the architect and design engineers (particularly the mechanical engineer and the

electrical engineer), the Mechanical Contractor (MC), the Plumbing Contractor (PC), the Electrical Contractor (EC), the TAB services provider (TAB), the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment which is part of a system identified to be commissioned. If known, other members of the Owner's building or plant operations / maintenance staff may also a member of the commissioning team.

B. Management. For this project, the Construction Phase CA is hired by the Owner and reports directly to the Owner while copying the Architect / Engineer and the remainder of the Commissioning Team members with all project correspondence. The CA directs and coordinates the commissioning activities. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. The CA's responsibilities are the same regardless of who hired the CA.

C. Scheduling. The CA will work with the General Contractor according to established protocols to schedule the commissioning activities. The CA will provide sufficient notice to the General Contractor for scheduling commissioning activities. The General Contractor will integrate all milestone commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The CA will provide the initial schedule (or possibly just sequence) of primary commissioning events at the commissioning scoping meeting. As construction progresses more detailed schedules are developed by the CA.

1.3 COMMISSIONING PROCESS

A. Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CA will complete the plan which is then considered the "final" construction phase commissioning plan, though it will continue to evolve and expand as the project progresses. The *Specifications* will take precedence over the *Commissioning Plan*.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

Construction / Acceptance Period

1. Commissioning during construction begins with a kickoff meeting conducted by the CA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings, if required throughout construction, will be scheduled by the CA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.
3. Equipment documentation is submitted to the CA during normal submittals for use in developing and finalizing project-specific Cx documentation.
4. The CA reviews the commissioned equipment submittals for compliance with contract requirements as well as for aspects related to commissioning and owner maintenance.
5. The CA develops prefunctional checklists to be completed for systems and equipment to be commissioned during the equipment startup and check-out process. These checklists are intended to augment, not replace, the

manufacturer's standard start-up / checkout documentation. These checklists are developed and completed using the on-line Cx Plus commissioning platform provided by BES Plus Tech.

6. The CA and the Subs work together to execute and document the prefunctional checklists and perform startup and initial checkout. In general the CA will complete the installation checks portion of the prefunctional checklists while the CA and the Subs will complete the equipment start-up / checkout portions. The CA documents that the checklists and startup were completed according to the approved plans.
7. The CA develops specific equipment and system functional performance test procedures. These tests are developed and completed using the on-line Cx Plus commissioning platform provided by BES Plus Tech.
8. The Controls Contractor sets up trending of system points and automated delivery of the trend reports as directed by CA. This data, if available prior to manual functional testing, is utilized to judge the readiness of systems to be tested.
9. The CA with the assistance of the TAB Contractor completes the Test, Adjust, Balance Verification (TAB-V) process. This must be successfully completed prior to beginning functional testing for each specific system.
10. The manual functional test procedures are executed by the Subs, under the direction of, and documented by the CA.
11. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.
12. Commissioning is substantially completed before Final Completion is granted to GC. This requires the issuance of a Final Construction Phase Cx Issues Log with all items resolved.

Warranty Period

1. For the duration of the Warranty Period the CA monitors the performance of the commissioned systems using the cloud-based Cx-PMOR system (BES Plus Tech Performance Plus) if contracted with the Owner to provide this service. Any items identified by this monitoring shall be resolved through the Contract Warranty Process.

1.4 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section.

230800	Mechanical Cx	Describes the Cx responsibilities of the mechanical, controls and TAB contractors and the prefunctional testing and startup responsibilities of each.
260500	Electrical Cx	Describes the Cx responsibilities of the electrical contractor.

1.5 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. It is noted that the services for the Project Manager, Architect, HVAC mechanical and electrical designers/engineers, and Commissioning Authority are not provided for in this contract. That is, the Contractor is not responsible for providing their services as they are contracted separately with

the Owner. Their responsibilities are listed here to clarify the commissioning process.

B. All Parties

1. Attend Pre-commissioning Meeting and normal construction period Commissioning Meetings, as deemed necessary by the CA, PM, and General Contractor to effectively participate in the Cx Process.
2. Each company / organization identified as being a member of the Cx Team shall designate an employee who is involved and familiar with the project to be the point-of-contact (POC) for the Cx process.
3. The identified POC shall regularly review the on-line Issue Log at the BES Plus Tech website project portal and the report documents which are emailed to the Cx Team.
4. The POC shall respond to any and all issues assigned to the company / organization that they are representing in the Cx Process within five (5) working days of the date the issue is added to the Log. Failure by a construction team member to effectively participate in the Cx Process, as judged by the Owner, can be considered cause for holding a construction progress payment.

C. Architect

Construction and Acceptance Phase

1. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as specifically contracted to the Owner.
2. Provide any design narrative documentation requested by the CA.
3. Coordinate resolution of system deficiencies identified during commissioning, according to the contract documents.
4. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

Warranty Period

1. Coordinate resolution of design non-conformance and design deficiencies identified during warranty-period commissioning.

D. Mechanical and Electrical Designers / Engineers (of the A/E)

Construction and Acceptance Phase

1. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. One site observation should be completed just prior to system startup.
2. Provide any design narrative and sequences documentation requested by the CA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
3. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.

4. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
5. Provide a presentation at one of the training sessions for the Owner's personnel.

Warranty Period

1. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during warranty-period.

E. Commissioning Authority (CA)

The CA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the General Contractor and his Subs. The primary role of the CA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. At the direction and discretion of the CA, the Contractors will provide tools or the use of tools to start, check-out and functionally test equipment and systems.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
2. Coordinate the commissioning work and, with the General Contractor, ensure that commissioning activities are being scheduled into the master schedule.
3. Plan and conduct a pre-commissioning meeting (Cx Kickoff Meeting) and participate in construction coordination and Owner-Contractor meetings as required to support the Cx Process.
4. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.
5. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
6. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the General Contractor reviews.
7. Write and distribute prefunctional tests and checklists.
8. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions / substitutions relating to the commissioning process. Assist in resolving any discrepancies.
9. Witness all or part of the HVAC piping test and flushing procedure, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures. At the discretion of the CA this testing may be witnessed by an alternate party (e.g. PM, TAB, General Contractor) as

approved by the CA, documentation shall be provided to the CA that the testing was completed satisfactorily and according to specifications.

10. Witness all or part of any ductwork testing and cleaning procedures, sufficient to be confident that proper procedures were followed. Document this testing and include the documentation in O&M manuals. Notify owner's project manager of any deficiencies in results or procedures. At the discretion of the CA this testing may be witnessed by an alternate party (e.g. PM, TAB, General Contractor) as approved by the CA, documentation shall be provided to the CA that the testing was completed satisfactorily and according to specifications.
11. Document equipment installation meets contract requirements by completion of the installation checks portion of the prefunctional checklists. Work together with Subs to complete the equipment start-up and check-out portion of the checklists. Approve prefunctional tests and checklist completion by reviewing prefunctional checklist reports and by selected site observation and spot checking.
12. Approve systems startup by reviewing start-up reports and by selected site observation.
13. Review TAB execution plan, discuss concerns and comments with TAB.
14. Oversee sufficient functional testing of the control system and approve it to be used for TAB, before TAB is executed.
15. Approve air and water systems balancing by spot testing, by reviewing completed reports and by selected site observation.
16. With necessary assistance and review from installing contractors, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing.
17. Analyze functional performance trend logs and monitoring data to verify performance.
18. Coordinate, witness and approve manual functional performance tests performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.
19. Maintain a master deficiency and resolution log (aka 'Issues Log') and a separate testing record. Provide the General Contractor with written progress reports and test results with recommended actions.
20. Provide a final commissioning report (as described in this section).

Warranty Period

1. Configure and maintain the cloud-based Cx-PMOR performance monitoring system throughout the Warranty Period to identify performance and operational issues. Issues shall be documented using On-Going Issues Log and shall be corrected by way of the Contract Warranty Process.
2. Verify completion and effectiveness of required deficiency corrections for issues discovered during Warranty Period.

F. General Contractor (GC)

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CA, and ensure that commissioning activities are being scheduled into the master schedule.
2. Include the cost of providing commissioning assistance to the CA as described in the drawings and this and other related specification sections in the total

contract price. *(do NOT include the cost of the Commissioning Authority as they are under contract to the Owner)*

5. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CA.
6. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks and training.
7. Review commissioning progress and deficiency reports.
8. Coordinate the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
9. Assist the Owner PM and the CA in coordinating the training of owner personnel.
10. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.
11. Coordinate the training of owner personnel in accordance to Contract Documents.
12. Prepare O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.

Warranty Period

1. Ensure that Subs complete deficiency corrections for issues discovered during Warranty Period.

G. Owner's Project Manager (PM)

Construction and Acceptance Phase

1. Manage the contract of the CA, A/E, and the General Contractor.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the *Commissioning Plan—Construction Phase*.
3. Provide final approval for the completion of the commissioning work.

Warranty Period

1. Ensure that any seasonal or deferred testing and any deficiency issues are addressed.

H. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment testing per agreements with Subs and as required by individual equipment specification sections.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor, except for stand-alone data logging equipment that may be used by the CA.
4. Provide information requested by CA regarding equipment sequence of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.
6. Provide Owner Training activities per individual equipment specification sections to include trainer personnel meeting specification qualification and experience requirements. Training provided shall meet or exceed the time duration as

specified in the equipment specification sections unless specifically authorized in writing by the Owner PM that less training is acceptable.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

Approval - acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

Basis of Design (BOD)- The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the design intent. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the design intent may be included. The document records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

Commissioning Authority (CA) - an independent agent, not otherwise associated with the General Contractor or his Subs. The CA directs and coordinates the day-to-day commissioning activities. Regardless of to whom the CA is contracted, the CA shall report directly to the Owner's Project Manager (PM).

Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

Contract Documents - the documents binding on parties involved in the construction of this project (drawings, specifications, change orders, amendments, contracts, *Cx Plan*, etc.).

Control system - the central building energy management control system.

Cx-PMOR – see PMOR.

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

General Contractor - the contractor providing general construction services and oversight of trade subcontractors as well as providing professionals who comprise the design team such as the HVAC mechanical designer/engineer and the electrical designer/engineer.

Design Intent - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Design Narrative or Design Documentation - sections of either the Design Intent or Basis of Design.

Factory Testing - testing of equipment on-site or at the factory by factory personnel with an Owner's representative present.

Functional Performance Test (FT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively

with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FTs are performed after prefunctional checklists and startup are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Manual Test - using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Over-written Value - writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation). See also "Simulated Signal."

Owner-Contracted Tests - tests paid for by the Owner outside the General Contractor's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Owner's Project Requirements (OPR) - A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Performance Monitoring, Optimization, and Reporting (PMOR) – cloud based SaaS (Software as a Service) which provides automated building operating data acquisition, analysis, archival, and reporting by utilizing data provided from the building automation system to continually analyze and improve the overall performance of the building and its underlying mechanical and electrical systems.

Phased Commissioning - commissioning that is completed in phases (by floors, for example) due to the size of the structure or other scheduling issues, in order minimize the total construction time.

Prefunctional Checklist (PC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a

three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. Prefunctional checklists augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Project Manager (PM) - the contracting and managing authority for the owner over the design and/or construction of the project, a staff position.

Sampling. - functionally testing only a fraction of the total number of identical or near identical pieces of equipment. Refer to Section 019113, Part 3.6, F for details.

Simulated Condition - condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

Simulated Signal - disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and DDC system to simulate a sensor value.

Specifications - the construction specifications of the Contract Documents.

Startup - the initial starting or activating of dynamic equipment, including executing prefunctional checklists.

Subs - the subcontractors to the General Contractor who provide and install building components and systems.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures.

Trending - monitoring using the building control system.

Vendor - supplier of equipment.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. The following systems or equipment will be commissioned in this project.

1. HVAC Systems:
   a. Packaged Rooftop Units (Dx Cooling, Gas Heating)
   b. Rooftop Dedicated Outside Air System
   c. DOAS Variable Air Volume Terminal Units with Electric Reheat
   d. Mini-Split DX Air Conditioning Units
   e. Air Distribution System Ductwork
   f. Exhaust Air Systems and equipment
   g. Kitchen Hood Make-up Air Unit
   h. Testing, Adjusting, Balancing
   i. HVAC Control System components
      (a.k.a. Building Automation System)

2. Domestic Hot Water Systems
   a. Domestic Water Heater(s)
   b. Recirculation Pump
   c. Thermostatic Mixing Valve

3. Electrical Systems:
   a. Power Distribution related to HVAC equipment
   b. Lighting Control Systems

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios, when required, shall be provided by the Division Contractor.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site, for the CA to use during functional testing, seasonal testing, and deferred testing. The equipment, tools, and instruments will be returned to the vendor / Subs after successful conclusion of the commissioning effort.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* If not otherwise noted, the following minimum requirements shall apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Humidity sensors shall have a certified calibration within the past 6 months and a resolution of +/- 1%. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 MEETINGS

A. Pre-Commissioning Meeting. The CA will schedule, plan and conduct a pre-commissioning meeting with the entire commissioning team in attendance. This is also known as the Commissioning Kickoff Meeting.

B. Miscellaneous Meetings. Meetings regarding the Commissioning Process that may be required throughout the construction period will be scheduled as agenda items at the General Contractor's regularly scheduled construction coordination meetings or Owner-Contractor meetings. An exception to this policy would be extraordinary meetings which are deemed necessary by the CA and the General Contractor with necessary parties attending in order to resolve outstanding deficiencies toward the end of the construction period.

3.2 REPORTING

A. The CA will provide regular reports to the Owner's PM with copy to the General Contractor, depending on the management structure, with increasing frequency as construction and commissioning progresses.

B. The CA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc. delivered via group email.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. Prior to project final completion the CA will provide to the PM a Final Construction Phase Commissioning Deficiencies Log with all identified construction phase commissioning issues resolved.

3.3 SUBMITTALS

A. The CA will provide appropriate contractors with a specific request for the type of submittal documentation the CA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. This request will include the manufacturer and model number, the manufacturer's printed installation and detailed start-up procedures, full sequences of operation, O&M data, performance data, any performance test procedures, and control drawings (e.g. typical formal construction submittals).

B. These submittals to the CA do not constitute compliance for O&M manual documentation and review of the equipment submittals is not for contract compliance. The O&M manuals are the responsibility of the Contractor, though the CA will review and utilize this documentation for purposes of facilitating the Commissioning process. Review of the equipment submittals for contract compliance is the responsibility of the A/E.

3.4 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.7, Systems to be Commissioned. Some systems that are not comprised so much of actual dynamic machinery and thus may have very simplified PCs and startup.

B. General. Prefunctional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system.

C. Start-up and Initial Checkout Plan. The CA shall assist the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of the CA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for prefunctional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms. Parties responsible for executing functional performance tests are identified in the testing requirements outlined in the *Commissioning Plan – Construction Phase*.

1. These checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
2. These checklists and tests are provided by the CA to the Contractor. The CA will complete the installation checks portion of the checklists while the Subs will assist the CA in completing the equipment start-up and check-out portions. Most forms will have more than one trade responsible for its execution.
3. The CA may utilize some or all of a manufacturer's start-up documentation.

D. Sensor and Actuator Calibration.
All field-installed temperature, relative humidity, CO, CO_2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. Alternate methods may be used, if approved by the Owner and CA before-hand. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.

All procedures used shall be fully documented on the prefunctional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

Sensor Calibration Methods

All Sensors. Verify that all sensor locations are appropriate and away from causes of erratic operation. Verify that sensors with shielded cable, are grounded only at one end. For sensor pairs that are used to determine a temperature or pressure difference, make sure they are reading within 0.2°F of each other for temperature and within a tolerance equal to 2% of the reading, of each other, for pressure. Tolerances for critical applications may be tighter.

Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading (via the permanent thermostat, gage or building

automation system (BAS)) is within the tolerances in the table below of the instrument-measured value. If not, install offset in BAS, calibrate or replace sensor.

Tolerances, Standard Applications

Sensor	Required Tolerance (+/-)	Sensor	Required Tolerance (+/-)
Cooling coil, chilled and condenser water temps	0.4F	Flow rates, water	4% of design
AHU wet bulb or dew point	2.0F	Relative humidity	4% of design
Hot water coil and boiler water temp	1.5F	Combustion flue temps	5.0F
Outside air, space air, duct air temps	0.4F	Oxygen or CO_2 monitor	0.1 % pts
Watthour, voltage & amperage	1% of design	CO monitor	0.01 % pts
Pressures, air, water and gas	3% of design	Natural gas and oil flow rate	1% of design
Flow rates, air	10% of design	Steam flow rate	3% of design
		Barometric pressure	0.1 in. of Hg

The above stated tolerances shall be considered the most stringent required. Based on field conditions and the relative affect of a sensor to the operation of the system(s) the CA may choose to relax the above tolerances at his discretion subject to approval of the PM.

Valve and Damper Stroke Setup and Check BAS Readout. For all valve and damper actuator positions checked, verify the actual position against the BAS readout. Set pumps or fans to normal operating mode. Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator.

E. Execution of Prefunctional Checklists and Startup.

1. Four weeks prior to startup, the Subs and vendors schedule startup and checkout with the General Contractor who will notify the CA. The performance of the prefunctional checklists, startup and checkout are directed and executed by the CA with the assistance of the Sub or vendor as required. The CA will primarily complete the installation checks portion of the checklists while the Subs will assist with the equipment start-up and check-out portion.
2. The Subs and vendors shall execute startup and provide the CA with a signed and dated copy of the completed start-up and prefunctional tests and checklists.
3. Only individuals that have direct knowledge and witnessed that a line item task on the prefunctional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The CA shall clearly list any outstanding items of the initial start-up and prefunctional procedures that were not completed successfully as notes within

the checklist on the commissioning website or as a deficiency in the on-line issue log.

2. The CA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CA will involve the A/E, PM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner and shall notify the CA as soon as outstanding items have been corrected and submit a response to the deficiency in the on-line issue log and request a recheck or retest of the item. When satisfactorily completed, the CA recommends approval of the execution of the checklists and startup of each system to the PM.

3.5 TEST, ADJUST, BALANCE (TAB) VERIFICATION (TAB-V)

A. TAB Agency shall provide labor and instruments to complete TAB Verification process with the Commissioning Agent. TAB Verification (TAB-V) shall be conducted to verify the contents of the Engineer-of-Record reviewed TAB Report. The verification shall include the following sampling rates and strategies:

1. Supply Air Flow: a sample 25% of the total supply air outlets / terminal unit calibrations shall be tested, acceptable tolerance shall be +/- 10% between the measured airflow and the design airflow / DDC indicated airflow. If more than 25% of the sample requires correction at the time of testing then another 10% of the total quantity of supply air outlets shall be tested.

2. Exhaust Air Balance: ALL exhaust air devices and equipment on the project shall be verified to have airflows balanced to +0% / -10% of the design airflow.

3. Outside Air Flow: ALL outside air flow balancing shall be verified and calibrated by the TAB Agency (with assistance of Controls Contractor) to be within +10% / -0% between the measured total airflow and the airflow indicated by the DDC system.

B. The TAB Agency may be responsible to pay for the additional trip(s) required of the Cx Professional to test additional outlets due to test failures on a time and material basis.

3.6 PERFORMANCE MONITORING, OPTIMIZATION & REPORTING (PMOR)

A. Objectives and Scope.

1. This project will utilize a cloud-based SaaS (Software as a Service) commissioning, performance monitoring, optimization, and reporting (PMOR) system which is provided under the CA contracted scope of work. The system shall be utilized during three distinctive phases of the project: construction, acceptance, and warranty phase.

B. Construction Phase - System Readiness:

1. The PMOR system will be utilized prior to Functional Performance Testing in order to gauge the readiness of the systems to be tested.
2. At least 10 days prior to the scheduled start of functional testing the BAS shall have delivered two weeks of operating data to the PMOR system. If the building automation system communication capabilities are not complete sufficiently to enable the BAS to email trend reports then the Controls Contractor shall manually generate two weeks trend data to a report. This manual report shall be the SAME EXACT REPORT FORMAT as was prior approved and will be used for the permanent reporting (specified elsewhere herein). This manual report shall either be emailed to the CA or shall be emailed to the project's specific PMOR email account.
3. Following receipt of two weeks of operating data (either automatically or manual) the CA shall review the data utilizing the PMOR system to assess the readiness of the specific system to begin on-site functional testing.
4. The CA shall notify the project team of the any deficiencies identified by the trend data analysis that would need to be addressed prior to beginning functional testing.

C. Acceptance Phase – Post Functional Test Monitoring:

1. The PMOR system shall be utilized following on-site Functional Testing to assess dynamic operation stability and to ensure the systems operate properly under varying load conditions and occupancy modes. This is a limited length testing and is intended to be conducted for a short period (approximately two weeks) prior the completion of the formal functional testing.
2. Any deficiencies identified during this monitoring period shall be added to the project Commissioning Issue Log to be addressed by the Contractor as construction deficiencies. Some deficiencies identified by this monitoring may required supplemental on-site functional testing to be performed at the cost of the Contractor.

D. Warranty Phase – Monitoring:

1. The PMOR system will be utilized during the first year following substantial completion to monitor the performance of the building and the individual systems.
2. Any operational deficiency identified by the system will be documented using the system's online Issue Log and the deficiency will be resolved through the contract's Project Warranty process.
3. At eleven months following substantial completion the CA shall provide a comprehensive review of the system operation using the PMOR system to analyze the data provided from the BAS. An updated Warranty Phase Issue Log shall be generated and the Contractor shall resolve all issues determined by the team to be subject to Warranty requirements.
4. At the Owner's option, and additional cost, the services of the CA and the PMOR system may be utilized after the expiration of the Warranty Phase as an On-Going Commissioning process.

3.7 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional testing for all divisions.

B. The general list of equipment to be commissioned is found in Section 019113, Part 1.4.

C. The parties responsible to execute each test are listed with each test in the functional test forms as published by the CA on the commissioning website.

D. Objectives and Scope. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. Specific modes required in this project are given in the *Commissioning Plan – Construction Phase*.

E. Development of Test Procedures. Before test procedures are written, the CA shall obtain all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. The CA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test, shall provide limited assistance to the CA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CA may submit the tests to the PM or General Contractor for review, if requested.

The CA shall review owner-contracted, factory testing or required owner acceptance tests which the CA is not responsible to oversee, including documentation format, and shall determine what further testing or format changes may be required to comply with the *Specifications*. Redundancy of testing shall be minimized.

The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.

The test procedure forms developed by the CA may include (but not be limited to) the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique prefunctional checklist and start-up documentation ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specific sequence of operations or other specified parameters being verified

8. Formulas used in any calculations
9. Required pre-test field measurements
10. Instructions for setting up the test.
11. Special cautions, alarm limits, etc.
12. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
13. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
14. A section for comments
15. Signatures and date block for the CA

F. Test Methods.

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone dataloggers (if stand-alone dataloggers are required then they will be provided and installed by the CA). The CA will determine which method is most appropriate for tests that do not have a method specified.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
3. Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate set point to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
4. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
5. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
6. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during prefunctional testing.
7. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The Sub executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test

according to the specified conditions. At completion of the test, the Sub shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

8. Sampling. Multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates their common identity. A small size or capacity difference, alone, does not constitute a difference. The specific recommended sampling rates are specified in the *Commissioning Plan – Construction Phase*. It is noted that no sampling by Subs is allowed in prefunctional checklist execution.

   A common sampling strategy referenced in the *Specifications* as the "xx% Sampling—yy% Failure Rule" is defined by the following example.

   xx = the percent of the group of identical equipment to be included in each sample.
   yy = the percent of the sample that if failing, will require another sample to be tested.

   The example below describes a 20% Sampling—10% Failure Rule.

   a. Randomly test at least 20% (xx) of each group of identical equipment. In no case test less than three units in each group. This 20%, or three, constitute the "first sample."
   b. If 10% (yy) of the units in the first sample fail the functional performance tests, test another 20% of the group (the second sample).
   c. If 10% of the units in the second sample fail, test all remaining units in the whole group.
   d. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the CA may stop the testing and require the responsible Sub to perform and document a checkout of the remaining units, prior to continuing with functionally testing the remaining units.

G. Coordination and Scheduling. The Subs shall provide sufficient notice to the CA regarding their completion schedule for the prefunctional checklists and startup of all equipment and systems. The CA will schedule functional tests through the General Contractor and affected Subs. The CA shall direct, witness and document the functional testing of all equipment and systems. The Subs shall execute the tests.

   In general, functional testing is conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

H. Test Equipment. Refer to Section 019113, Part 2 for test equipment requirements.

I. Problem Solving. The CA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the General Contractor and his Subs.

3.8 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose by the CA on the commissioning website. Once published, these forms are available for review by all members of the commissioning team on the website.

C. Non-Conformance.

1. The CA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted in the online issue log and reported to the Cx Team Members via electronic notification or periodic reports generated from the website.
2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution will be documented on the procedure form as well as the online commissioning issue log.
3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner PM.
4. As tests progress and a deficiency is identified, the CA discusses the issue with the executing contractor.
    a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:
        1) The CA documents the deficiency and the Sub's response and intentions and they go on to another test or sequence. After the day's work, the CA documents the deficiency in the on-line commissioning issue log and assigns to the Sub for correction. Once the Sub has corrected the deficiency they will notify the CxP in the issue log of the resolution and that the item is ready to be retested.
        2) The CA reschedules the test and the test is repeated.

    b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
        1) The deficiency shall be documented on the on-line commissioning log with the Sub's response regarding the deficiency. The deficiency is assigned to the party to whom the CA believes responsible for resolution or whose input is required to proceed to resolution.
        2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the Architect and his Consultants. Final acceptance authority is with the CA and the Owner Project Manager.
        3) The CA documents the resolution process using the online issue log.
        4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency. Once the responsible party has corrected the deficiency they will notify the CA in the issue log of the resolution and that the item is ready to be retested.

5. Cost of Retesting.

   a. At the discretion of the CA, A/E, and the Owner, the cost for the *Sub* to retest a functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the GC.

   b. For a deficiency identified, not related to any start-up or initial checkout fault, the following shall apply: The CA and PM will direct the retesting of the equipment once at no "charge" to the GC for their time. However, the CA's time for a second retest will be charged to the GC, who may choose to recover costs from the responsible Sub.

   c. The time for the CA to direct any retesting required because a specific start-up or checkout item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the GC, who may choose to recover costs from the party responsible for executing the faulty prefunctional test.

6. The Contractor shall respond using the commissioning website concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution. Comments shall be provided at least five (5) days after deficiency is noted or prior to a scheduled commissioning meeting whichever occurs first.
8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Approval. The CA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CA and by the Owner PM, if necessary.

3.9 OPERATION AND MAINTENANCE MANUALS / FINAL COMMISSIONING REPORT

A. O&M Manuals.

1. The specific content and format requirements for the project O&M manuals shall be per General Contractors contract requirements with Owner and General Contractor standard format for such. Special requirements for the controls contractor and TAB contractor are found in their respective specification sections.

2. CA Review and Approval. For this project the CA will not be involved in review and approval of the O&M manuals.

3. Final Commissioning Report Details. The final commissioning report shall include the following:

   a. Final Construction Phase Commissioning Deficiency Report
   b. Completed Prefunctional Checklist forms
   c. Completed TAB Verification forms
   d. Completed Functional Performance Test forms

4. Other documentation will be retained by the CA.

3.10 TRAINING OF OWNER PERSONNEL

A. The GC shall coordinate with the Owner for desired training sequencing and scheduling and shall provide the approved schedule of training to the Owner and CA for review and approval. The Mechanical Contractor, Controls Contractor, Electrical Contractor, and Equipment Suppliers shall complete all training activities and documentation as directed by the GC, the approved schedule, and the specific equipment specification sections.

3.11 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the *Specifications.* The *Commissioning Plan—Construction Phase,* lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By
1. Final commissioning plan	CA
2. Cx Meeting minutes	CA
3. Commissioning schedules	CA with General Contractor
4. Equipment documentation submittals	Subs
5. Sequence clarifications	Subs and General Contractor
6. Prefunctional checklists	CA
7. Final TAB report	TAB
8. Issues Log (deficiencies)	CA
10. Functional test forms	CA
11. O&M manuals	Subs
12. Overall training plan	GC
13. Specific training agendas	Subs / GC
14. Final commissioning deficiencies log	CA

END OF SECTION 01 91 13

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SECTION 03 15 10 – RAMMED AGGREGATE PIER FOUNDATION SYSTEM

PART 1: GENERAL REQUIREMENTS

1.01 Description

Work shall consist of designing, furnishing, and installing Rammed Aggregate Pier foundations to the lines and grades designated on the project foundation plan and as specified herein. The aggregate piers shall be constructed by either augering a cavity or driving a hollow mandrel to the design depth and vertically ramming lifts of aggregate using the specially designed tamper head and high-energy impact densification equipment to create the compacted aggregate pier. The Rammed Aggregate Pier elements shall be in a columnar-type configuration and shall be used to produce an Intermediate Foundation® system for support of foundation loads.

1.02 Work Included

A. Provision of all equipment, material, labor, and supervision to design and install Rammed Aggregate Pier elements. Design shall rely on subsurface information presented in the project geotechnical report. Site/working grade preparation, layout of Rammed Aggregate Pier elements, spoil removal (as required), footing excavations, and subgrade preparation following aggregate pier installation is not included.

B. The Rammed Aggregate Pier design and installation shall adhere to all methods and standards described in this Specification.

C. Drawings and General Provisions of the Contract, including General and Supplemental Conditions, and Division 1 Specifications, apply to the work in this specification.

1.03 Approved Installers

A. Installers of Rammed Aggregate Pier foundation systems shall have a minimum of 5 years of experience with the installation of Rammed Aggregate Pier systems.

B. Installers or equal.

1. Geopier Foundation Company, Inc.
2. Terra Systems, Inc.
3. Subsurface Constructors, Inc.

1.04 Reference Standards

A. Modulus and Uplift Testing

1. ASTM D 1143 - Pile Load Test Procedures
2. ASTM D 1194 - Spread Footing Load Test

B. Materials and Inspection

1. ASTM D 1241 - Aggregate Quality
2. ASTM D 422 - Gradation of Soils

D. Where specifications and reference documents conflict, the Rammed Aggregate Pier Designer shall make the final determination of the applicable document.

1.05 Certifications and Submittals

A. Design Calculations - The Installer shall submit detailed design calculations and construction drawings prepared by the Rammed Aggregate Pier Designer (the Designer) for review and approval by the Owner or Owner's Engineer. All plans shall be sealed by a Professional Engineer in the State in which the project is constructed.

B. Professional Liability Insurance - The Rammed Aggregate Pier Designer shall have Errors and Omissions design insurance for the work. The insurance policy should provide a minimum coverage of $3 million per occurrence.

C. Modulus and Uplift Test Reports – A modulus test(s) is performed on non-production Rammed Aggregate Pier elements as required by the Rammed Aggregate Pier Designer to verify the design assumptions. The Installer shall furnish the General Contractor a description of the installation equipment, installation records, complete test data, analysis of the test data and verification of the design parameter values based on the modulus test results. The report shall be prepared under direction of a Registered Professional Engineer.

D. Daily Rammed Aggregate Pier Progress Reports – The Installer shall furnish a complete and accurate record of Rammed Aggregate Pier installation to the General Contractor. The record shall indicate the pier location, length, volume of aggregate used or number of lifts, densification forces during installation, and final elevations or depths of the base and top of piers. The record shall also indicate the type and size of the installation equipment used, and the type of aggregate used. The Installer shall immediately report any unusual conditions encountered during installation to the General Contractor, to the Designer and to the Testing Agency.

PART 2: MATERIALS

2.01 Aggregate

A. Aggregate used by the Rammed Aggregate Pier Installer for pier construction shall be preapproved by the Designer and shall demonstrate suitable performance during modulus testing. Typical aggregate consists of Type 1 Grade B in accordance with ASTM D-1241-68, No. 57 stone, recycled concrete or other graded aggregate approved by the Designer.

B. Potable water or other suitable source shall be used to increase aggregate moisture content where required. The General Contractor shall provide such water to the Installer.

PART 3: DESIGN REQUIREMENTS

3.01 Rammed Aggregate Pier Design

A. The design of the Rammed Aggregate Pier system shall be based on the service load bearing pressure and the allowable total and differential settlement criteria of all footings indicated by the design team for support by the Rammed Aggregate Pier system. The Rammed Aggregate Pier system shall be designed in accordance with generally accepted engineer-

ing practice and the methods described in Section 1 of these Specifications. The design life of the structure shall be 50 years.

B. The design shall meet the following criteria.

Maximum Allowable Bearing Pressure for Footings supported by Rammed Aggregate Pier Reinforced Soils	8,000 psf
Estimated Total Long-Term Settlement for Footings:	≤ 1-inch
Estimated Long-Term Differential Settlement of Adjacent Footings:	≤ ½-inch

C. The Rammed Aggregate Pier elements shall be designed and installed to completely penetrate existing fills where encountered and designs shall consider stresses imposed by adjacent footings, as applicable.

D. The Rammed Aggregate Pier elements shall be designed using a Rammed Aggregate Pier stiffness modulus (to be verified by the results of the modulus test described in Section 5.02 of these specifications) or other method(s) approved by the Designer .

3.02 Design Submittal

The Installer shall submit detailed design calculations, construction drawings, and shop drawings, (the Design Submittal), for approval at least _2_ week(s) prior to the beginning of construction. A detailed explanation of the design parameters for settlement calculations and uplift resistance shall be included in the Design Submittal. Additionally, the quality control test program for Aggregate Pier system, meeting these design requirements, shall be submitted. All computer-generated calculations and drawings shall be prepared and sealed by a Professional Engineer, licensed in the State or Province where the piers are to be built. Submittals will be submitted electronically only unless otherwise required by specific submittal instructions.

PART 4: EXECUTION

4.01 Approved Installation Procedures

The following sections provide general criteria for the construction of the Rammed Aggregate Pier elements. Unless otherwise approved by the Designer, the installation method used for Rammed Aggregate Pier construction shall be that as used in the construction of the successful modulus test.

A. Augered Rammed Aggregate Pier systems –

1. Augered Rammed Aggregate Pier system shall be pre-augered using mechanical drilling or excavation equipment.

2. If cave-ins exceeding 10% of the lift volume occur during excavation such that the sidewalls of the hole are deemed to be unstable, steel casing shall be used to stabilize the cavity, or a displacement Rammed Aggregate Pier system may be used.

3. Aggregate shall be placed in the augered cavity in lift thicknesses as determined by the Rammed Aggregate Pier Designer.

4. A specially designed beveled tamper and high-energy impact densification apparatus shall be employed to densify lifts of aggregate during installation. The apparatus shall apply direct **downward** impact energy to each lift of aggregate. Compaction equipment that induces horizontal vibratory energy is not permitted.

B. Displacement Rammed Aggregate Pier systems –

1. Displacement Rammed Aggregate Pier systems shall be constructed by advancing a specially designed mandrel with a minimum 15-ton static force augmented by dynamic vertical ramming energy to the full design depth. The hollow-shaft mandrel, filled with aggregate, is incrementally raised, permitting the aggregate to be released into the cavity, and then lowered by vertically advancing and/or ramming to densify the aggregate and force it laterally into the adjacent soil. The cycle of raising and lowering the mandrel is repeated to the top of pier elevation. The cycle distance shall be determined by the Rammed Aggregate Pier designer.

2. Special high-energy impact densification apparatus shall be employed to vertically densify the Rammed Aggregate Pier elements during installation of each constructed lift of aggregate.

3. Densification shall be performed using a mandrel/tamper. The mandrel/tamper foot is required to adequately increase the lateral earth pressure in the matrix soil during installation. Compaction equipment that induces horizontal vibratory energy is not permitted.

4. Downward crowd pressure shall be applied to the mandrel during installation.

4.02 Plan Location and Elevation of Rammed Aggregate Pier Elements

The as-built center of each pier shall be within 6 inches of the locations indicated on the plans. Piers installed outside of the above tolerances and deemed not acceptable by the Designer shall be rebuilt at no additional expense to the Owner.

4.03 Rejected Rammed Aggregate Pier Elements

Rammed Aggregate Pier elements installed beyond the maximum allowable tolerances shall be abandoned and replaced with new piers unless the Designer approves the condition or provides other remedial measures. All material and labor required to replace rejected piers shall be provided at no additional cost to the Owner unless the cause of rejection is due to an obstruction or mislocation.

PART 5: QUALITY CONTROL

5.01 Control Technician

The Installer shall have a full-time, on-site Control Technician to verify and report all installation procedures. The Installer shall immediately report any unusual conditions encountered during installation to the Rammed Aggregate Pier Designer, the General Contractor, and to the Testing Agency.

5.02 Rammed Aggregate Pier Modulus Test

As required by the RAP designer, a Rammed Aggregate Pier Modulus Test(s) will be performed at location(s) agreed upon by the Rammed Aggregate Pier Designer to verify or modify Rammed Aggregate Pier designs. Modulus Test Procedures shall utilize appropriate portions of ASTM D 1143 and ASTM D 1194, as outlined in the Rammed Aggregate Pier design submittal. RAP modulus test shall be performed as outlined in Technical Bulletin No. 12 (Wissmann and Carter, 2015). The test element shall be tested to a load equal to the element area times at least 150 percent of the RAP element's maximum design stress (not allowable bearing pressure for footings) to demonstrate that the element exhibits safe response during service loading. Single-element modulus tests that are proposed to be loaded as a function of allowable bearing pressure are not considered standard practice and will not be accepted since the allowable bearing pressure is often only a fraction of the RAP element's maximum design stress.

5.04 Bottom Stabilization Testing (BSTs) / Crowd Stabilization Testing (CSTs)

Bottom stabilization testing (BSTs) or Crowd stabilization testing (CSTs) shall be performed by the Control Technician during the installation of the modulus test pier. Additional testing as required by the Rammed Aggregate Pier Designer shall be performed on selected production Rammed Aggregate Pier elements to compare results with the modulus test pier.

PART 6: QUALITY ASSURANCE

6.01 Independent Engineering Testing Agency (Owner's Quality Assurance)

The Rammed Aggregate Pier Installer shall provide full-time Quality Control monitoring of Rammed Aggregate Pier construction activities. The Owner or General Contractor is responsible for retaining an independent engineering testing firm to provide Quality Assurance services.

6.02 Responsibilities of Independent Engineering Testing Agency

A. The Testing Agency shall monitor the modulus test pier installation and testing. The Installer shall provide and install all dial indicators and other measuring devices.

B. The Testing Agency shall monitor the installation of Rammed Aggregate Pier elements to verify that the production installation practices are similar to those used during the installation of the modulus test elements.

C. The Testing Agency shall report any discrepancies to the Installer and General Contractor immediately.

D. The Testing Agency shall observe the excavation, compaction and placement of the foundations as described in Section 7.05. Dynamic Cone Penetration testing or other approved testing methods may be performed to evaluate the footing bottom condition as determined by the Testing Agency.

PART 7: RESPONSIBILITIES OF THE GENERAL CONTRACTOR

7.01 Site Preparation and Protection

A. The General Contractor shall locate and protect underground and aboveground utilities and other structures from damage during installation of the Rammed Aggregate Pier elements.

B. Site grades for Rammed Aggregate Pier installation shall be within 1 foot of the top of footing elevation or finished grade elevation to minimize Rammed Aggregate Pier installation depths. Ground elevations and bottom of footing elevations shall be provided to the Rammed Aggregate Pier Installer in sufficient detail to estimate installation depth elevations to within 3 inches.

C. The General Contractor will provide site access to the Installer, after earthwork in the area has been completed. A working surface shall be established and maintained by the General Contractor to provide wet weather protection of the subgrade and to provide access for efficient operation of the Rammed Aggregate Pier installation.

D. Prior to, during and following Rammed Aggregate Pier installation, the General Contractor shall provide positive drainage to protect the site from wet weather and surface ponding of water.

E. If spoils are generated by Rammed Aggregate Pier installation, spoil removal from the Rammed Aggregate Pier work area in a timely manner to prevent interruption of Rammed Aggregate Pier installation is required.

7.02 Rammed Aggregate Pier Layout

The location of Rammed Aggregate Pier-supported foundations for this project, including layout of individual Rammed Aggregate Pier elements, shall be marked in the field using survey stakes or other means approved by the Installer at locations shown on the drawings.

7.03 Contractor's / Owner's Independent Testing Agency (Owner's Quality Assurance)

General Contractor is responsible for acquiring an Independent Testing Agency (Quality Assurance) as required. Testing Agency roles are as described in Part 6 of this specification. The Aggregate Pier Installer will provide Quality Control services as described in Part 5 of this specification.

7.04 Excavations of Obstructions

A. Should any obstruction be encountered during Rammed Aggregate Pier installation, the General Contractor shall be responsible for promptly removing such obstruction, or the pier shall be relocated or abandoned. Obstructions include, but are not limited to, boulders, timbers, concrete, bricks, utility lines, etc., which shall prevent installing the piers to the required depth or shall cause the pier to drift from the required location.

B. Dense natural rock or weathered rock layers shall not be deemed obstructions, and piers may be terminated short of design lengths on such materials.

7.05 Utility Excavations

The General Contractor shall coordinate all excavations made subsequent to Rammed Aggregate Pier installations so that excavations do not encroach on the piers as shown in the Rammed Aggregate Pier construction drawings. Protection of completed Rammed Aggregate Pier elements is the responsibility of the General Contractor. In the event that utility excavations are required in close proximity to the installed Rammed Aggregate Pier elements, the General Contractor shall contact the Rammed Aggregate Pier Designer immediately to develop construction solutions to minimize impacts on the installed Aggregate Pier elements.

7.06 Footing Bottoms

A. Excavation and surface compaction of all footings shall be the responsibility of the General Contractor.

B. Foundation excavations to expose the tops of Rammed Aggregate Pier elements shall be made in a workman-like manner, and shall be protected until concrete placement, with procedures and equipment best suited to (1) avoid exposure to water, (2) prevent softening of the matrix soil between and around the Rammed Aggregate Pier elements before pouring structural concrete, and (3) achieve direct and firm contact between the dense, undisturbed Rammed Aggregate Pier elements and the concrete footing.

C. All excavations for footing bottoms supported by Rammed Aggregate Pier foundations shall be prepared in the following manner by the General Contractor. Recommended procedures for achieving these goals are to:

1. Limit over-excavation below the bottom of the footing to 3-inches (including disturbance from the teeth of the excavation equipment).

2. Compaction of surface soil and top of Rammed Aggregate Pier elements shall be prepared using a motorized impact compactor ("Wacker Packer," "Jumping Jack," or similar). Sled-type tamping devices shall only be used in granular soils and when approved by the designer. Loose or soft surficial soil over the entire footing bottom shall be recompacted or removed, respectively. The surface of the aggregate pier shall be recompacted prior to completing footing bottom preparation.

3. Place footing concrete immediately after footing excavation is made and approved, preferably the same day as the excavation. Footing concrete must be placed on the same day if the footing is bearing on moisture-sensitive soils. If same day placement of footing concrete is not possible, open excavations shall be protected from surface water accumulation. A lean concrete mud-mat may be used to accomplish this. Other methods must be pre-approved by the Designer.

D. The following criteria shall apply, and a written inspection report sealed by the project Testing Agency shall be furnished to the Installer to confirm:

1. That water (which may soften the unconfined matrix soil between and around the Rammed Aggregate Pier elements and may have detrimental effects on the supporting capability of the Rammed Aggregate Pier reinforced subgrade) has not been allowed to pond in the footing excavation at any time.

2. That all Rammed Aggregate Pier elements designed for each footing have been exposed in the footing excavation.

3. That immediately before footing construction, the tops of Rammed Aggregate Pier elements exposed in each footing excavation have been inspected and recompacted as necessary with mechanical compaction equipment.

4. That no excavations or drilled shafts (elevator, etc) have been made after installation of Aggregate Pier elements within the excavation limits described in the Rammed Aggregate Pier construction drawings, without the written approval of the Installer or Designer.

E. Failure to provide the above inspection and certification by the Testing Agency, which is beyond the responsibility of the Rammed Aggregate Pier Installer, may void any written or implied warranty on the performance of the Rammed Aggregate Pier system.

END OF DOCUMENT 03 15 10

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.

B. Related Requirements:

1. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.
2. Section 32 13 13 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: fly ash and other pozzolans subject to compliance with requirements.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete Subcontractor.
    e. Special concrete finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, shoring procedures, vapor-retarder installation, anchor rod and

anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer, testing agency.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency:

1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. 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."

B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

A. 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.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is

calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301.
2. ACI 117.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

    a. High-density overlay, Class 1 or better.
    b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
    c. Structural 1, B-B or better; mill oiled and edge sealed.
    d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that 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.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does 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 glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, 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.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

C. Plain-Steel Wire: ASTM A 1064/A 1064M, as drawn.

D. Deformed-Steel Wire: ASTM A 1064/A 1064M.

E. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

F. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

2.4 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: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

A. 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.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I Type II, gray.
2. Fly Ash: ASTM C 618, Class F.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3M coarse aggregate or better, 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. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C 260/C 260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Carlisle Coatings & Waterproofing Inc.
b. CETCO, a Minerals Technologies company.
c. Concrete Sealants Inc.
d. Henry Company.
e. JP Specialties, Inc.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum water-vapor permeance of 0.1. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Barrier-Bac; Inteplast Group, Ltd.
b. Fortifiber Building Systems Group.
c. ISI Building Products.
d. Poly-America, L.P.
e. Raven Industries, Inc.
f. Reef Industries, Inc.

g. Stego Industries, LLC.
h. Tex-Trude, LP.

2.8 CURING MATERIALS

A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. Manufacturers or equal: Subject to compliance with requirements.

a. BASF Corporation.
b. ChemMasters, Inc.
c. Dayton Superior.
d. Euclid Chemical Company (The); an RPM company.
e. Kaufman Products, Inc.
f. Lambert Corporation.
g. Laticrete International, Inc.
h. Metalcrete Industries.
i. Nox-Crete Products Group.
j. SpecChem, LLC.
k. Vexcon Chemicals Inc.
l. V-Seal Concrete Sealers & Specialty Coatings.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

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. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 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. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.
2. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct 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 ITEM INSTALLATION

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 303.
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 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 support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not 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 SHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT INSTALLATION

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting 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 reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth 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 when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is 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 not to 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.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing bed.

D. 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 exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

E. 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 thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases as indicated on drawings.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 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 remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.
b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse

aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform inspections and prepare reports.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and to submit reports.

C. Inspections: See Structural Inspections Plan on drawings.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours

3.17 MATERIAL SPECIFICATIONS

A. Concrete

1. Footing and foundation walls is 3500 PSI @ 28 days.

2. Slab on grade is 3500 PSI @ 28 days.

3. All other CIP Concrete not noted is 3500 PSI @ 28 days.

4. Concrete reinforcing steel is 60 KSI, ASTM A615.

5. Welded wire reinforcing is 65 KSI, ASTM A185.

6. Anchor Rods is ASTM F1554 Grade 36.

7. Adhesive Anchors is HILTI HAS-E Threaded Rod with 150 HY injection or equal.

8. Mechanical Anchors is HILTI KWIK Bolt III or Equal .

9. Power driven fasteners is HILTI DS or equal.

END OF SECTION 03 30 00

SECTION 03 35 43 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polished concrete finishing, including staining and scoring.
2. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete not designated as polished concrete.

1.2 DEFINITIONS

A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Cast-in-place concrete subcontractor.
e. Polished concrete finishing Subcontractor.

2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

C. Samples for Initial Selection: For each type of product requiring color selection.

D. Samples for Verification: For each type of exposed color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Repair materials.
2. Stain materials.
3. Liquid floor treatments.

1.6 QUALITY ASSURANCE

A. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches (1200 by 1200 mm) minimum, to demonstrate the expected range of finish, color, and appearance variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
3. Demolish and remove field sample panels when directed.

B. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
2. Demonstrate curing, finishing, and protecting of polished concrete.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 STAIN MATERIALS

A. Penetrating Stain: Water-based, acrylic latex, penetrating stain with colorfast pigments.

Manufacturers or equal: Subject to compliance with requirements.
1. Scofield Formula One
2. Prosoco Consolideck
3. Ameripolish

2.2 LIQUID FLOOR TREATMENTS

Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

Manufacturers or equal: Subject to compliance with requirements.
1. Scofield Formula One
2. Prosoco Consolideck
3. Ameripolish

PART 3 - EXECUTION

3.1 POLISHING

A. Polish: Level 2: Low sheen, 400 grit.

B. Aggregate exposure: B, Salt & Pepper

C. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.

1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
6. Control and dispose of waste products produced by grinding and polishing operations.
7. Neutralize and clean polished floor surfaces.

3.2 STAINING

A. Newly placed concrete to be at least 30 days old before staining.

B. Prepare surfaces according to manufacturer's written instructions and as follows:

1. Clean concrete thoroughly by scraping, applying solvents or stripping agents, sweeping and pressure washing, or scrubbing with a rotary floor machine and detergents recommended by stain manufacturer. Rinse until water is clear and allow surface to dry.

    a. Do not use acidic solutions to clean surfaces.

2. Test surfaces with droplets of water. If water beads and does not penetrate surface, or penetrates only in some areas, profile surfaces by grinding, sanding, or abrasive blasting. Retest and continue profiling surface until water droplets immediately darken and uniformly penetrate concrete surfaces.
3. Apply acidic solution to dampened concrete surfaces, scrubbing with uncolored, acid-resistant nylon-bristle brushes until bubbling stops and concrete surface has texture of 120-grit sandpaper. Do not allow solution to dry on concrete surfaces. Rinse until water is clear. Control, collect, and legally dispose of runoff.

C. Scoring: Score decorative jointing in concrete surfaces 1/16 inch (1.6 mm) deep with diamond blades to match pattern indicated. Rinse until water is clear. Score before staining.

1. Joint Width: 3/8 inch (10 mm).

D. Allow concrete surface to dry before applying stain. Verify readiness of concrete to receive stain according to ASTM D4263 by tightly taping 18-by-18-inch (450-by-450-mm), 4-mil- (0.1-mm-) thick polyethylene sheet to a representative area of concrete surface. Apply stain only if no evidence of moisture has accumulated under sheet after 16 hours.

E. Reactive Stain: Apply reactive stain to concrete surfaces according to manufacturer's written instructions and as follows:

1. Apply stain by uncolored bristle brush, roller, or high-volume, low-pressure sprayer and immediately scrub into concrete surface with uncolored, acid-resistant nylon-bristle brushes in continuous, circular motion. Do not spread stain after fizzing stops. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup.
2. Remove stain residue after four hours by wet scrubbing with commercial-grade detergent recommended by stain manufacturer. Rinse until water is clear. Control, collect, and legally dispose of runoff.

F. Penetrating Stain: Apply penetrating stain to concrete surfaces according to manufacturer's written instructions and as follows:

1. Apply first coat of stain to dry, clean surfaces by airless sprayer or by high-volume, low-pressure sprayer.
2. Allow to dry four hours and repeat application of stain in sufficient quantity to obtain color consistent with approved mockup.

3. Rinse until water is clear. Control, collect, and legally dispose of runoff.

END OF SECTION 03 35 43

SECTION 04 81 00 - UNIT MASONRY ASSEMBLIES

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 unit masonry assemblies consisting of the following:

1. Concrete masonry units.
2. Mortar and grout.
3. Reinforcing steel.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Embedded flashing.
7. Miscellaneous masonry accessories.
8. Masonry-cell insulation.

B. Products installed, but not furnished, under this Section include the following:

1. Allowances, furnished under Division 1 Section “Allowances”.
2. Steel lintels and shelf angles for unit masonry, furnished under Div. 5 Section "Metal Fabrications."
3. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
4. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section “Steel Doors & Frames.”
5. Aluminum doors and frames in unit masonry openings, furnished under Division 8 Section “Aluminum Entrances and Storefronts.”

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following net-area compressive strengths (f'm) at 28 days. Determine compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1. For Concrete Unit Masonry: f'm = 1500 psi.

1.5 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.

1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

2. Provide bullnose corner units for all outside corners in public areas and double bullnose units for open ends of all wing walls.

3. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

a. Where fire-resistance-=rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

3. Integral Water Repellent: Provide units made with integral water repellent.

a. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

4. Insulated CMU's: Where indicated, units shall contain rigid, specially shaped, cellular thermal insulation units complying with ASTM C 578, Type I, designed for installing in cores of masonry units.

B. Concrete Masonry Units: ASTM C 90 and as follows:

1. Weight Classification: Light weight.
2. Size (Width): Manufactured to the following dimensions:

a. 4 inches nominal; 3-5/8 inches actual.
b. 6 inches nominal; 5-5/8 inches actual.
c. 8 inches nominal; 7-5/8 inches actual.
d. 12 inches nominal; 11-5/8 inches actual.

3. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

D. Mortar Cement: ASTM C 1329.

E. Masonry Cement: ASTM C 91.

1. For pigmented mortar, use a colored cement formulation as required to produce the color indicated or, if not indicated, as selected from manufacturer's standard formulations.

a. Mortar color to be selected by Architect.

F. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

1. White-Mortar Aggregates: Natural white sand or ground white stone.
2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C 404.

H. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

J. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

K. Water: Potable.

L. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Colored Portland Cement-Lime Mix:

   Manufacturers or equal: Subject to compliance with requirements.

   a. Eaglebond; Blue Circle Cement.
   b. Color Mortar Blend; Glen-Gery Corporation.
   c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
   d. Centurion Colorbond PL; Lafarge Corporation.
   e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
   f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).

2. Mortar Cement:

   Manufacturers or equal: Subject to compliance with requirements.

   a. Magnolia Superbond Mortar Cement; Blue Circle Cement.
   b. Lafarge Mortar Cement; Lafarge Corporation.

3. Mortar Pigments:

   Manufacturers or equal: Subject to compliance with requirements.

   a. True Tone Mortar Colors; Davis Colors.
   b. Centurion Pigments; Lafarge Corporation.
   c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

4. Cold-Weather Admixture:

   Manufacturers or equal: Subject to compliance with requirements.

   a. Accelguard 80; Euclid Chemical Co.
   b. Morseled; W. R. Grace & Co., Construction Products Division.
   c. Trimix-NCA; Sonneborn, Div. of ChemRex, Inc.

5. Water-Repellent Admixture:

   Manufacturers or equal: Subject to compliance with requirements.

   a. Mortar Tite; Addiment Inc.
   b. Dry-Block Mortar Admixture; W. R. Grace & Co., Construction Products Division.
   c. Rheopel; Master Builders.

2.3 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M.

2.4 MASONRY JOINT REINFORCEMENT

A. General: ASTM A 951 and as follows:

1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
2. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.

2.5 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.

C. Steel Sheet, Galvanized after Fabrication: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153.

D. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.6 BENT WIRE TIES

A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.

B. Wire: Fabricate from 1/4-inch- diameter, hot-dip galvanized steel wire.

2.7 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.

B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch (0.85-mm), galvanized steel sheet.

C. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:

1. Nonheaded bolts, bent in manner indicated.

D. Postinstalled Anchors: Anchors as described below, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Type: Chemical anchors.
2. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
3. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.
4. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to four times the loads imposed.
5. For Postinstalled Anchors in Grouted Masonry Units: Capability to sustain, without failure, a load equal to six times the loads imposed.

2.8 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide solid metal flashing within spanning cell voids or cavities without support.

B. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of 0.030 inch.

C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

D. Products: Subject to compliance with requirements.

1. Metal Flashing:

Manufacturers or equal: Subject to compliance with requirements.

a. Cheney Flashing (Dovetail); Cheney Flashing Company, Inc.
b. Cheney Flashing (Sawtooth); Cheney Flashing Company, Inc.
c. Keystone 3-Way Interlocking Thruwall Flashing; Keystone Flashing Co.

2. Rubberized-Asphalt Flashing:

Manufacturers or equal: Subject to compliance with requirements.

a. Dur-O-Barrier; Dur-O-Wal, Inc.
b. Perm-A-Barrier Wall Flashing; W. R. Grace & Co., Construction Products Division.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from closed cell expanded rubber.

B. Preformed Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.

2.10 MASONRY-CELL INSULATION

A. Basis of Design Insulation: Tailored Foam, Inc. Core-Fill-500 or equal. Provide R=20 assembly.

B. The Foamed-in-Place insulation shall be compliant with VOC regulations and self-extinguishing or non-combustible. Insulation shall be properly installed in accordance with the manufacturer's specifications.

2.11 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal of water.

2.12 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.

1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
2. For masonry below grade, in contact with earth, and where indicated, use Type S.
3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; use Type M or S.
4. For interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
3. For filled cells or lintels, provide 3000 psi, pea gravel concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. The masonry walls are “non-self-supporting”. Adequate temporary support must be provided by the contractor until required connections or elements are in place. Bracing shall be per the “2012 Standard Practice for Bracing Masonry Walls Under Construction”.

3.3 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10, nor 1/2 inch maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.

E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below, unless noted otherwise as shown on Architectural Building Elevation drawings.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated. See drawings for joint patterns.

C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

    a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete to comply with the following:

1. Provide an open space not less than 1 inch (25 mm) wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.

2. Anchor masonry with anchors embedded in masonry joints and attached to structure.

3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

B. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.

C. Form control joints in concrete masonry as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

3.9 LINTELS

D. Install steel lintels where indicated.

E. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

1. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

F. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND VENTS

G. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

H. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.

I. Install flashing as follows:

1. At lintels and shelf angles, extend flashing a minimum of 4 inches into masonry at each end. At heads and sills, extend flashing 4 inches at ends and turn flashing up not less than 2 inches to form a pan.
2. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
3. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
4. Cut flashing off flush with face of wall after masonry wall construction is completed.

J. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

3.11 REINFORCED UNIT MASONRY INSTALLATION

K. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.

1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

L. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.

M. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.

1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

3.12 REPAIRING, POINTING, AND CLEANING

N. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

O. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

P. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

Q. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

END OF SECTION 04 81 00

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. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.
2. Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting" for painting requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Forged-steel hardware.
7. Shop primer.
8. Galvanized-steel primer.
9. Etching cleaner.
10. Galvanized repair paint.
11. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

C. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator professional engineer testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control reports.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.

B. Connection Design Information:

1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Allowable Stress Design; data are given at factored-load level.

C. Moment Connections: Type FR, fully restrained.

D. Construction: Combined system of moment frame, braced frame, and shear walls.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: Fy=50 ksi, ASTM A992/A992M.

B. Channels, Angles: ASTM A36/A36M.

C. Steel Plate: Fy =55 ksi, AS529/ A572 / A1011.

D. Cold-Formed Hollow Structural Sections: Fy= 46 ksi, ASTM A500/A500M, Grade C structural tubing.

E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

F. Welding Electrodes: Comply with AWS requirements.

G. Cold form shapes: Fy = 55 ksi, ASTMA653 / A1011.

H. Roofing and wall sheeting: A563 / A792.

I. 22 ga B-deck Grade 50.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

2.4 RODS

A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.

1. Nuts: ASTM A563 heavy-hex carbon steel.
2. Plate Washers: ASTM A36/A36M carbon steel.

3. Washers: ASTM F436, Type 1, hardened carbon steel.
4. Finish: Plain.

B. Threaded Rods: ASTM A36/A36M ASTM A193/A193M, Grade B7.

1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Plain.

2.5 FORGED-STEEL STRUCTURAL HARDWARE

A. Clevises and Turnbuckles: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1035.

B. Eye Bolts and Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1030.

C. Sleeve Nuts: Made from cold-finished carbon-steel bars, ASTM A108, AISI C-1018.

2.6 PRIMER

A. Steel Primer:

1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
2. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#26 MPI#80, MPI#134.

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 ASTM A780/A780M.

2.7 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.8 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.

5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1. SSPC-SP 2. SSPC-SP 3.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.9 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.11 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Corrosion-resisting (weathering) steel surfaces.
7. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. 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.

2.12 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
2. Bolted Connections: Inspect shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E165/E165M.
    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94/E94M.

4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.

5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include 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 on Drawings.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates 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. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.

a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1) Liquid Penetrant Inspection: ASTM E165/E165M.
2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
3) Ultrasonic Inspection: ASTM E164.
4) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 05 12 00

SECTION 05 21 00 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. K-series steel joist substitutes.
3. LH-series long-span steel joists.
4. DLH-series long-span steel joists.
5. Steel joist accessories.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for installing bearing plates in concrete.

1.2 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings:

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer, professional engineer.

B. Welding certificates.

C. Manufacturer certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Mill Certificates: For each type of bolt.

F. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

G. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications.

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equeal: Subject to compliance with requirements.

1. Canam Buildings US Inc.; Canam Group Inc.
2. Gooder-Henrichsen Co.
3. New Millennium Building Systems, LLC.
4. Structures of U.S.A., Inc.
5. Valley Joist.
6. Vulcraft/Verco Group; a division of Nucor Corp.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated on Drawings.

1. Use ASD; data are given at service-load level unless noted.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:
   a. Roof Joists: Vertical deflection of 1/360 of the span.

2.3 STEEL JOISTS

A. K-Series Steel Joist: Manufactured steel joists of type indicated according to "Standard Specification for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists.
2. K-Series Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
3. Provide holes in chord members for connecting and securing other construction to joists.
4. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated on Drawings, complying with SJI's "Specifications."
5. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated on Drawings, complying with SJI's "Specifications."
6. Camber joists according to SJI's "Specifications."
7. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

B. Long-Span Steel Joist: Manufactured steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated on Drawings.

1. Provide holes in chord members for connecting and securing other construction to joists.
2. Camber long-span steel joists according to SJI's "Specifications" and as indicated on Drawings.
3. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

A. Primer:

1. SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.
2. Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 09 91 23 "Interior Painting."

2.5 STEEL JOIST ACCESSORIES

A. Bridging:

1. Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Steel bearing plates with integral anchorages are specified in Section 05 50 00 "Metal Fabrications."

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Plain.

D. Welding Electrodes: Comply with AWS standards.

E. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

D. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 09 91 23 "Interior Painting."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using carbon-steel bolts.

E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 REPAIRS

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Touchup Painting:

1. Immediately after installation, clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists abutting structural steel, and accessories.

    a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
    b. Apply a compatible primer of same type as primer used on adjacent surfaces.

2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

END OF SECTION 05 21 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Acoustical roof deck.
3. Composite floor deck.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for normal-weight structural concrete fill over steel deck.
2. Section 05 12 00 "Structural Steel Framing" for shop- and field-welded shear connectors.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:

1. Welding certificates.
2. Product Certificates: For each type of steel deck.

B. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   a. Acoustical roof deck.

2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Qualification Statements: For welding personnel and testing agency.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:

a. AWS D1.1/D1.1M.
b. AWS D1.3/D1.3M.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store products in accordance with SDI MOC3. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

2.2 ROOF DECK

A. Manufacturers or equal: Subject to compliance with requirements.

1. ASC Steel Deck; ASC Profiles, LLC.
2. Canam Buildings US Inc.; Canam Group Inc.

3. Cordeck.
4. DACS, Inc.
5. Epic Metals Corporation.
6. Marlyn Steel Decks, Inc.
7. Miami Metal Deck.
8. New Millennium Building Systems, LLC.
9. OEG Building Materials Inc.
10. Roof Deck, Inc.
11. Tristate Decking, Inc.
12. Valley Joist.
13. Verco Decking, Inc.; a Nucor company.
14. Vulcraft Group; Division of Nucor Corp.
15. Vulcraft/Verco Group; a division of Nucor Corp.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI standards for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Galvanizing Repair Paint: ASTM A780/A780M.

J. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; manufacturer's written instructions; and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter

1. Weld Diameter: As indicated.
2. Weld Spacing: as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals as indicated:

1. Mechanically fasten with self-drilling, carbon-steel screws as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive in accordance with manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified 072100 Building Insulation.

3.4 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: as indicated.
2. Weld Spacing: as indicated

    a. Weld edge ribs of panels at each support. Space additional welds an average of 12inches apart, but not more than 18 inches apart.
    b. Space and locate welds as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, as indicated, and as follows:

1. Mechanically fasten with self-drilling, carbon-steel screws as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting:

1. Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
2. Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.

a. Field welds will be subject to inspection.

2. Steel decking will be considered defective if it does not pass tests and inspections.
3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.

C. Prepare test and inspection reports.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing wall framing.
2. Interior non-load-bearing wall framing.
3. Soffit framing.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 09 21 16.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
3. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Exterior non-load-bearing wall framing.
3. Interior non-load-bearing wall framing.
4. Vertical deflection clips.
5. Single deflection track.
6. Drift clips.
7. Soffit framing.
8. Post-installed anchors.
9. Power-actuated anchors.
10. Sill sealer gasket.
11. Sill sealer gasket/termite barrier.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

C. Delegated-Design Submittal: For cold-formed steel framing.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product Certificates: For each type of code-compliance certification for studs and tracks.

D. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

E. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements.

1. ACI Building Systems
2. American Buildings Company
3. APEC
4. Big Bee Buildings
5. CBC Steel Buildings
6. Covenant Building
7. Gulf States
8. Kirby Building Systems
9. Nucor Buildings
10. Vulcan Steel Structures.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

    a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height 10yr wind.
    b. Interior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 10 lbf/sq. ft.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope 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.

5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and ASTM C955, Section 8.

D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Framing Members, General: Comply with AISI 200 and ASTM C955, Section 8 for conditions indicated.

B. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G60.

2.4 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: 0.0329 inch.
2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers or equal: Subject to compliance with requirements.

a. AllSteel & Gypsum Products, Inc.
b. ClarkDietrich.
c. Marino\WARE.
d. SCAFCO Steel Stud Company.
e. Steel Construction Systems.
f. Steel Network, Inc. (The).
g. Steeler, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.06 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.5 INTERIOR 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: 0.052 inch.
2. Flange Width: 1-3/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
2. Flange Width: 1-1/4 inches.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers or equal: Subject to compliance with requirements.

a. AllSteel & Gypsum Products, Inc.
b. ClarkDietrich.
c. Marino\WARE.
d. SCAFCO Steel Stud Company.
e. Steel Network, Inc. (The).
f. Steeler, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch.
2. Flange Width: 1 inch plus the design gap for one-story structures.

2.6 SOFFIT FRAMING

A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.052 inch.
2. Flange Width: 1-5/8 inches, minimum.

2.7 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

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. Stud kickers and knee braces.
9. Joist hangers and end closures.
10. Hole-reinforcing plates.
11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC193 ICC-ES AC58 or ICC-ES AC308 as appropriate for the substrate.

1. Uses: Securing cold-formed steel framing to structure.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
3. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M.

B. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

C. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. 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 required to obtain fire-resistance ratings indicated. Protect remaining fire-resistive materials from damage.

C. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and 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 steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF EXTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing infill studs and anchor to building structure.
4. Connect drift clips to cold-formed steel framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap 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.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

3.5 INSTALLATION OF INTERIOR NONLOADBEARING WALL FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated on Shop Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.
2. Connect vertical deflection clips to studs and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
2. Strap 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.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 INSTALLATION TOLERANCES

A. Install cold-formed steel 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.

3.7 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 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. Loose bearing and leveling plates.
2. Loose steel lintels.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Miscellaneous metal trim.

B. Related Sections include the following:

1. Division 5 Section "Structural Steel" for structural-steel framing system components.
2. Division 5 Section “Pipe and Tube Railings” for metal pipe and tube handrails and railings.
3. Division 5 Section “Ornamental Railings” for decorative metal handrails and railings.

1.3 SUBMITTALS

A. Product Data for each product, including finishing materials and methods.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. Provide templates for anchors and bolts specified for installation under other Sections.

1.4 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

1. Galvanized finish for exterior installations and where indicated.

D. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 ALUMINUM

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6063-T6.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.

2.4 PAINT

A. Shop Primer for Ferrous Metal: Organic zinc rich coating – Tnemec Series 90-97. Tnemec-zinc applied at a rate to achieve 2.5-3.5 mils DFT.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.6 GROUT

A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout com- plying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.7 CONCRETE FILL

A. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.8 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent- metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no rough- ness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and sur- face temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.9 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.10 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches, unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls.

2.11 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports indicated and as necessary to complete the Work.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches wide by 1/4 inch thick by 8 inches long at 24 inches o.c., unless otherwise indicated.

C. Galvanize miscellaneous framing and supports where indicated.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches from each end, 6 inches from corners, and 24 inches o.c., unless otherwise indicated.

C. Galvanize miscellaneous steel trim in the following locations:

1. Exterior.

2.13 FIXED WALL LADDERS

A. Basis of design or equal: ALACO Model 561 fixed wall ladders with handrails over roof and lockable security door. Components fabricated from 6061-T6 aluminum alloy.

B. Finish: Clear anodized aluminum.

2.14 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

ASTM A 123, for galvanizing steel and iron products.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Interior and Exterior Ferrous Metals: SSPC – SP6NACE No. 3, "Commercial Blast Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for se- curing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and sur- faces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. 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.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion re- sistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no rough- ness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: 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 com- ply with the coating manufacturer’s recommendations.

1. Apply by brush or spray to provide a minimum 3.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use non-shrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

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A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified above for setting and grouting bearing and leveling plates.

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A. Touchup Painting: 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 com- ply with the coating manufacturer’s recommendations.

1. Apply by brush or spray to provide a minimum 3.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 52 00 – ALUMINUM HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Division 01 - General Requirements, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2 SUMMARY

A. Scope: Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for aluminum handrails and railings as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:

1. Aluminum handrails.
2. Aluminum railings.

1.3 REFERENCES

A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. Aluminum Association, Inc. (AA):

1. AA SAS-30, "Specifications for Aluminum Structures."

C. American Architectural Manufacturers Association (AAMA):

1. AAMA 611, "Voluntary Specifications for Anodized Architectural Aluminum (Revised)."
2. AAMA 2604, "Voluntary Specification, Performance Requirements, and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels."
3. AAMA 2605, "Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."
4. AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

D. American Iron and Steel Institute (AISI):

1. AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

E. American Welding Society (AWS):

1. AWS D1.2, "Structural Welding Code – Aluminum."

F. ASTM International (ASTM):

1. ASTM B26/B26M,"Standard Specification for Aluminum-Alloy Sand Castings."
2. ASTM B209/B209M,"Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate."
3. ASTM B210/B210M, "Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes."
4. ASTM B221/B221M, "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes."
5. ASTM B247/B247M, "Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings."
6. ASTM B429/B429M, "Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube."
7. ASTM C1048, "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass."
8. ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink)."
9. ASTM E488, "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements."
10. ASTM E985, "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings."

G. Code of Federal Regulation (CFR):

1. 16 CFR Part 1201, "Safety Standard for Architectural Glazing Material" (Consumer Products Safety Commission).

H. National Association of Architectural Metal Manufacturers (NAAMM):

1. NAAMM MFM, "Metal Finishes Manual."

1.4 DEFINITIONS

A. See definitions in ASTM E985 for railing-related terms that apply to this Section.

1.5 PERFORMANCE REQUIREMENTS

A. General: Handrails and railings shall withstand structural loading as determined by allowable design working stresses of materials based on the following standards.

1. Aluminum: AA SAS-30.

B. Structural Performance: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:

1. Top Rail: Shall withstand the following loads:
   a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf per foot (730 N/m) applied horizontally or vertically downward.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.
2. Handrails not Serving as Top Rails: Shall withstanding the following loads:
   a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
   b. Uniform load of 50 lbf per foot (730 N/m) applied in any direction.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.

3. Guard Infill Area: Shall withstand the following loads:
   a. Concentrated horizontal load of 50 lbf (222 N) applied to 1 square foot (0.09 m^2) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on guard.

C. Thermal Movements: Handrails and railings shall allow for movements resulting from 120 degree F (49 degree C) changes in ambient and 180 degree F (82 degree C) surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

D. Corrosion Resistance: Separate incompatible materials to prevent galvanic corrosion.

1.6 SUBMITTALS

A. General: Submit under provisions of Section 01 33 00 - Submittal Procedures.

B. Product Data:

1. Submit manufacturer’s data sheets on each product to be used, including, but not limited to, the following:
   a. Preparation instructions and recommendations.
   b. Storage and handling requirements and recommendations.
   c. Installation methods.
2. Submit product data for manufacturers product lines of handrails and railings assembled from standard components, including, but not limited to, the following:
   a. Grout, anchoring cements and paint products.

C. Shop Drawings: Submit shop drawings showing fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other work.

D. Samples:

1. Color Selection: Black anodized. Submit manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.
2. Finish Selection: Provide sections of railing or flat sheet metal which depict available mechanical surface finishes.
3. Verification Samples: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work. If finishes involve

normal color and texture variations, include sample sets showing the full range of variations expected.

a. 6 inch (152 mm) long sections of each different linear railing member, including handrails and top rails.

E. Quality Control Submittals:

1. Design Data: For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data signed and sealed by the professional engineer who was responsible for their preparation.
2. Qualification Data: Submit documentation demonstrating capability and experience in performing installations of the same type and scope as specified by this Section. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

3. Certificates: Submit certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC's).

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of aluminum handrails and railings of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 5 years.
2. Installer Qualifications: Installer shall be a firm that shall have a minimum of 5 years of successful installation experience with projects utilizing aluminum handrails and railings similar in type and scope to that required for this Project.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Mock-Ups: Prior to installation of the work, fabricate and erect mock-ups for each type of finish and application required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work. Locate mock-ups on site in location and of size indicated or, if not indicated, as directed by the Architect. Demonstrate the proposed range of aesthetic effects and workmanship to be expected in the completed work. Obtain the Architect's acceptance of mock-ups before start of final unit of work. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of work.

1. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of work.

D. Single Source Responsibility: Obtain aluminum handrails and railings from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

A. Environmental Requirements: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. General: See Section 01 77 00 - Closeout Procedures.

B. Warranty: Provide manufacturer's standard form outlining the terms and conditions of their Standard Limited Warranty:

1. Surface Finish Warranty: One-year limited warranty.
2. Material Integrity Warranty: One year limited warranty.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

1.11 EXTRA MATERIALS

A. All supplemental materials not expressly specified in this section shall be approved by the Architect prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design or equal: Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect will be the sole judge of the basis of what is equivalent.

2.2 MATERIALS

A. Application/Scope of Work:

1. Architectural railing.

B. Basis of Design or equal: Gelander Industries G205-B rail profile with vertical pickets.

C. Metals: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

1. Aluminum: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.
   a. Extruded Bar and Tube: ASTM B221/B221M, Alloy 6063-T5/T52.
   b. Extruded Structural Pipe and Tube: ASTM B429/B429M, Alloy 6063-T832.
   c. Drawn Seamless Tube: ASTM B210/B210M, Alloy 6063-T832.
   d. Plate and Sheet: ASTM B209/B209M, Alloy 6061-T6.
   e. Die and Hand Forgings: ASTM B247/B247M, Alloy 6061-T6.
   f. Castings: ASTM B26/B26M, Alloy A356-T6.

2. Brackets, Flanges, and Anchors: Provide cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
   a. Provide cast brackets with flange tapped for concealed anchorage to threaded hanger bolt.
   b. Provide formed or cast brackets with predrilled hole for exposed bolt anchorage.
   c. Provide formed steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
   d. Provide brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

D. Railing Components:
1. Extruded Aluminum Components: Provide manufacturer's standard extruded aluminum components as follows:
   a. Standard Post: 2.376 inches (60.35 mm) by 2.376 inches (60.35 mm) with radiused corner, 0.100 inch (2.54 mm) wall thickness.
   b. Bottom Rail: 1.6926 inches (42.99 mm) high by 1.676 inches (43.57 mm) wide with a 0.765 inch (19.43 mm) wide pocket on the top and an open bottom.
   c. Picket: 0.750 inches (19.05 mm) by 0.750 inches (19.05 mm), 0.062 inch (1.57 mm) wall thickness.
   d. Top Rail: Circular cross section, radius as indicated on the Drawings or, if not indicated, as selected by the Architect from the manufacturer's standards with an open bottom, 0.0866 inch (2.20 mm) wall thickness.

2. Condensation Insert: Provide rigid plastic post insert to evacuate entrapped water in hollow sections of railing members, 2-3/8 inches (60 mm) by 2-3/8 inches (60 mm) by 4-1/8 inches (105 mm) high.

E. Fasteners:
1. Handrail Anchors: Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads
   .
2. Handrail and Railing Component Anchors: Use fasteners fabricated from same basic metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

a. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.
b. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

3. Cast-in-Place and Post Installed Anchors: Provide anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four items the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

a. Cast-in-place anchors.

F. Grout and Anchoring Cement:
1. Non-Shrink, Non-Metallic Grout: Provide factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.3 FABRICATION

A. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Form changes in direction of railing members as shown on the Drawings.

C. Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

D. Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

E. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

F. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

G. Cut, reinforce, drill, and tap components as indicated on the Drawings to receive finish hardware, screws, and similar items.

H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide mounted handrail wall returns at wall ends unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

2.4 FINISHES

A. General: Comply with NAAMM MFM for recommendations for applying and designating finishes.

1. Appearance of Finished Work:
   a. Variations in appearance of abutting or adjacent units are acceptable if they are within one-half of the range of final samples. Noticeable variations in the same unit are not acceptable.
   b. Variations in appearance of other components are acceptable if they are within the range of final samples and are assembled or installed to minimize contrast.

B. Aluminum Finish: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

1. Class I Color Anodized Finish: AA-M21-C22-A42/A44 (Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, film thicker than 0.7 mil [0.018 mm] with integral color or electrolytically deposited color) complying with AAMA 611. Provide color to match the Architect's sample, or, if no sample, as selected by the Architect from within full range of industry colors and color density range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Examine substrates to receive anchors verifying that locations of concealed reinforcements have been clearly marked for the Installer. Locate reinforcements and mark locations if not already done.
2. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchors, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the Project site.

3.3 INSTALLATION

A. General:

1. Fitting: Fit exposed connections together to form tight, hairline joints.
2. Cutting and Placement: Set handrails and railings accurately in location, alignment, and elevation measured from established lines and levels and free from rack.

a. Do not weld, cut, or abrade coated or finished surfaces of railing components that are intended for field connection by mechanical or other means without further cutting or fitting.
b. Align rails so variations from level or parallel alignment do not exceed 1/4 inch in 12 feet (1.6 mm per m).
c. Provide manufacturer's proprietary system to evacuate entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources, in order to prevent water from entering the concrete slab. In lieu of the manufacturer's proprietary system, if acceptable to the Architect, provide another means to evacuate the entrapped water, i.e., a weephole and epoxy fill system ("drill-and-fill").
d. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with non-metallic, non-shrink grout, mixed and placed to comply with anchoring material manufacturer's directions.

3. Corrosion Protection: Provide separation as recommended by manufacturer on concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals.
4. Adjusting: Adjust handrails and railings before anchoring to ensure alignment at abutting joint's space posts at interval indicated, but not less than required to achieve structural loads.
5. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

B. Non-Welded Railings Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.

3.4 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and appoint exposed areas with same material.

B. Cleaning: Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

3.5 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the aluminum handrails and railings shall be without damage at time of Substantial Completion.

B. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

END OF SECTION 05 52 00

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Shear wall panels.
4. Rooftop equipment bases and support curbs.
5. Wood blocking, cants, and nailers.
6. Wood furring and grounds.
7. Wood sleepers.
8. Utility shelving.
9. Plywood backing panels.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. 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, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant

progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841. For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not bleed through, contain colorants, or otherwise adversely affect finishes.

F. Application: Treat items indicated on Drawings, including all exterior wood framed walls.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.

1. Application: Interior partitions not indicated as load bearing.
2. Species:
   a. Southern pine or mixed southern pine; SPIB.
   b. Spruce-pine-fir; NLGA.
   c. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.

B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20.0 MPa) for 12-inch nominal- (286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi (13 700 MPa).

D. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi (20 MPa) for 12-inch nominal- (286-mm actual-) depth members.
2. Modulus of Elasticity, Edgewise: 2,000,000 psi (15 100 MPa).

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of:

1. Mixed southern pine or southern pine; SPIB.

C. Concealed Boards: 19 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. 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.

E. 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.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1 Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.8 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall 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, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.9 METAL FRAMING ANCHORS

A. See Structural Drawings for additional information.

B. Allowable design loads, as published by manufacturer, shall meet or exceed those of products of manufacturers listed. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. Joist Hangers: U-shaped joist hangers with 2-inch- (50-mm-) long seat and 1-1/4-inch- (32-mm-) wide nailing flanges at least 85 percent of joist depth.

1. Thickness: 0.062 inch (1.6 mm).

F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

1. Strap Width: 2 inches (50 mm).
2. Thickness: 0.062 inch (1.6 mm).

G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch (25 mm) above base and with 2-inch- (50-mm-) minimum side cover, socket 0.062 inch (1.6 mm) thick, and standoff and adjustment plates 0.108 inch (2.8 mm) thick.

H. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

I. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick by 36 inches (914 mm) long.

J. Wall Bracing: T-shaped bracing made for letting into studs in saw kerf, 1-1/8 inches (29 mm) wide by 9/16 inch (14 mm) deep by 0.034 inch (0.85 mm) thick with hemmed edges.

K. Wall Bracing: Angle bracing made for letting into studs in saw kerf, 15/16 by 15/16 by 0.040 inch (24 by 24 by 1 mm) thick with hemmed edges.

2.10 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less.

D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.

E. Install shear wall panels to comply with manufacturer's written instructions.

F. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

H. Do not splice structural members between supports unless otherwise indicated.

I. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.

J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches (2438 mm) o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal (38-mm actual) thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. (9.3 sq. m) and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet (6 m) o.c.

K. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

L. 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.

M. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

O. Use steel common 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. Drive nails snug but do not countersink nail heads unless otherwise indicated.

P. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with indicated fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches (38 mm) wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal (89-mm actual) depth for openings 48 inches (1200 mm) and less in width, 6-inch nominal (140-mm actual) depth for openings 48 to 72 inches (1200 to 1800 mm) in width, 8-inch nominal (184-mm actual) depth for openings 72 to 120 inches (1800 to 3000 mm) in width, and not less than 10-inch nominal (235-mm actual) depth for openings 10 to 12 feet (3 to 3.6 m) in width.
2. For load-bearing walls, provide double-jamb studs for openings 60 inches (1500 mm) and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R502.5(1) or Table R502.5(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00 - SHEATHING

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. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 06100 "Rough Carpentry" for plywood backing panels.
2. Section 07272 "Air Barrier Coatings" for air barrier coatings applied over wall sheathing.
3. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing for roof board applied over roof sheathing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not

extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings.

2.4 WALL SHEATHING

A. Plywood Sheathing: Exposure 1 sheathing.

1. See Structural Drawings for Span Ratings and Thicknesses.

B. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Basis-of-Design: GP DensGlass Sheathing
2. Type and Thickness: Regular, 1/2 inch (13 mm); Type X, 5/8 inch (15.9 mm**)** thick. See drawings for locations.

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. For roof, parapet and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Screws for Fastening Sheathing to Wood Framing: ASTM C 1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall, parapet, and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:

    a. Glue and nail to wood framing.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch (3 mm) apart at edges and ends.

2. Wall and Roof Sheathing:

    a. Nail to wood framing.
    b. Screw to cold-formed metal framing.
    c. Space panels 1/8 inch (3 mm) apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with nails or screws.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
4. Install panels with a 1/4-inch (6.4-mm) gap or over furring where they abut masonry, concrete or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 06 16 00

SECTION 06 20 00 - FINISH CARPENTRY

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. Interior standing and running trim.

1.3 DEFINITIONS

A. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

B. MDF: Medium-density fiberboard.

C. MDO Plywood: Plywood with a medium-density overlay on the face.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.

B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Lumber: AWPA C2. Kiln dry after treatment to a maximum moisture content of 19 percent.

B. Plywood: AWPA C9. Kiln dry after treatment to a maximum moisture content of 18 percent.

C. Preservative Chemicals: Acceptable to authorities having jurisdiction

D. Do not use material that is warped or does not comply with requirements for untreated material.

E. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

2.3 INTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim for Opaque Finish (Painted): Finish lumber (S4S), either finger jointed or solid lumber, one of the following species and grades:
1. Grade finish or 1 Common eastern white pine; NELMA or NLGA.
2. MDF is an available option as long as it is owner approved prior to bidding.

B. Moldings: Made to patterns included in WNMPA WM 7. Wood moldings made from kiln-dried stock and graded under WNMPA WM 4.
1. Moldings for Opaque Finish (Painted): P-grade eastern white, ponderosa, or sugar pine.
2. See drawings for profiles.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

1. Where galvanized finish is indicated, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.

2.5 FABRICATION

A. Back out or kerf backs of the following members except those with ends exposed in finished work:

1. Interior standing and running trim except shoe and crown molds.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.

1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.

1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
2. Install trim after gypsum board joint finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during remainder of the construction period.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 00

SECTION 06 41 16 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

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. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product, including high-pressure decorative laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural plastic-laminate cabinets.

C. Samples for Initial Selection:

1. Plastic laminates.
2. PVC edge material.
3. Thermoset decorative panels.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish.
2. Wood-grain plastic laminates, 12 by 24 inches (300 by 600 mm), for each type, pattern and surface finish.

3. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Certificates: For each type of product.

1. Composite wood and agrifiber products.
2. Thermoset decorative panels.
3. High-pressure decorative laminate.
4. Glass.
5. Adhesives.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 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. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is

complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 25 and 55 percent during the remainder of the construction period.

C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.

D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

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. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087111 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Type of Construction: Frameless.

D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

E. Reveal Dimension: 1/2 inch (13 mm).

F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.

G. Laminate Cladding for Exposed Surfaces:

a. Horizontal Surfaces: Grade HGS.

b. Postformed Surfaces: Grade HGP.
c. Vertical Surfaces: Grade VGS.
d. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
e. Pattern Direction: As indicated.

H. Materials for Semi-exposed Surfaces:

a. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.

i. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
ii. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
iii. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.

b. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
c. Drawer Bottoms: Thermoset decorative panels.

I. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

J. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

K. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

a. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

L. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

a. As indicated by laminate manufacturer's designations.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."

B. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 100 degrees of opening.

C. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.

D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.

E. Shelf Rests: BHMA A156.9, B04013; metal.

F. Drawer Slides: BHMA A156.9.

1. Grade 1 and Grade 2: Side mounted; full-extension type; zinc-plated steel with polymer rollers.
2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-overtravel-extension type; zinc-plated-steel ball-bearing slides.
3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide Grade 2.
4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide Grade 1.
5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide Grade 1HD-100.
6. For computer keyboard shelves, provide Grade 1.

G. Door Locks: BHMA A156.11, E07121.

H. Drawer Locks: BHMA A156.11, E07041.

I. Door and Drawer Silencers: BHMA A156.16, L03011.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
3. Bright Brass, Vacuum Coated: BHMA 723 for brass base; BHMA 729 for zinc-coated-steel base.
4. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
5. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
6. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
7. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate cabinets to dimensions, profiles, and details indicated.

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.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

E. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required.

3.2 INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.

C. 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 (3 mm in 2400 mm).

D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. Use filler matching finish of items being installed.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 06 41 16

SECTION 07 13 20 - SELF-ADHERING SHEET WATERPROOFING

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. Rubberized asphalt sheet waterproofing & drainage sheet.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch square of waterproofing and flashing sheet.

2. 8x8 inch square of drainage matt.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 SHEET WATERPROOFING

A. Rubberized ashphalt: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Basis-of-Design Product, or equal: Envirosheet self-adhering sheet waterproofing.

2. Physical Properties:

   a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
   b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
   c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
   d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
   e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
   f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
   g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
   h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

   1. Thickness: 1/8 inch, nominal.
   2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

H. Base & Sheet Drainage Composite

1. Aquadrain® 15XP - 4-ft by 52-ft roll of a three-dimensional polypropylene drainage core with a nonwoven geotextile adhered to one side to allow water passage while restricting soil particles. Composite includes a thin polyethylene sheet on the back of the drainage core.

A. Compressive Strength, 15,000psf (718 kPa); B. Water Flow Rate, 20gpm/ft (251 l/m/m);

C. Thickness, 7/16" (11 mm)

2. Aquadrain® 100BD Base Drain – 1" (25 mm) thick x 12" (300 mm) high base drain composite designed to collect water from sheet composite drainage and then discharge the water to proper sump system or gravity to daylight.

A. Compressive Strength, 10,000psf (457 kPa); B. Water Flow rate, 97gpm/ft (1,197 l/m/m);

C. Thickness, 1" (25 mm)

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 waterproofing.

1. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing 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.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).

F. Bridge and cover discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

a. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and protrusions according to ASTM D 6135.

3.3 SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic.

G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

I. Immediately install protection course or Aquadrain with butted joints over waterproofing membrane.

3.4 FIELD QUALITY CONTROL

A. Prepare test and inspection reports.

3.5 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 20

SECTION 07 21 00 - BUILDING INSULATION

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. Glass-Fiber Blanket
2. Spray Foam Insulation
3. Expanded Polystyrene

B. Related Sections: The following Sections contain requirements that relate to this Section: 1. Division 4 Section "Unit Masonry" for masonry cell insulation.
2. Division 9 Section Gypsum Board Assemblies for sound attenuation blankets.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by 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.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C665, Type 1; with maximum flame-spread and smoke developed indexes of 25 and 50, respectively, per ASTM E 84, passing ASTM E 136 for combustion characteristics.

1. Manufacturers or equal: Subject to compliance with requirements:
   a. CertainTeed Corporation: www.certainteed.com
   b. Guardian Building Products: www.guardianbp.com
   c. Johns Manville Corporation: www.jm.com
   d. Knauf Insulation GmbH: www.knaufinsulation.us.
   e. Owens Corning Corp. www.owenscorning.com

2.2 SPRAY FOAM INSULATION

A. Two-component, closed cell spray foam, medium density, MD 1- based polyurethane thermoset foam.
   1. Basis-of-Design Product: CertainTeed CertaSpray Closed Cell Foam

B. Thermal Barrier
   1. Basis-of-Design Product or equal: Flame Seal – TB, a two-part fire retardant coating over spray applied polyurethane foam insulation.
   2. Color to be Gray.

2.3 EXPANDED POLYSTYRENE

A. 60 PSI high-strength insulation; an engineered closed-cell, lightweight, and resilient EPS which meets or exceeds the requirements of ASTM C578, Type XV, Standard Specifications for Rigid, Cellular Polystyrene Thermal Insulation with a nominal density of 3.0 lb/cu. ft.

1. Basis-of-Design Product or equal: Carlisle Company, Insulgrade XV.

2. See drawings for thickness and R-value.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated 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. Apply single layer of insulation to produce thickness indicated.

3.4 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use installation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
   5. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
   6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
      a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).

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 00 - VAPOR RETARDERS

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. Polyethylene vapor retarders.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for under-slab vapor retarders.
2. Section 072100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D4397, 15 mil thick sheet, with maximum permeance rating of 0.01 perm (5.7 ng/Pa x s x sq. m).

B. Products or equal: Subject to compliance with requirements:
1. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC.
2. Perminator (15-mil) by W.R. Meadows
3. Yellow Guard (15-mil) Vapor Barrier by Poly-America

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Place vapor retarders on side of construction indicated on Drawings.

B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 INSTALLATION OF VAPOR RETARDERS IN CRAWL SPACES

A. Install vapor retarders over prepared grade. Lap joints a minimum of 12 inches (305 mm) and seal with manufacturer's recommended tape. Install second layer over pathways to equipment.

B. Extend vapor retarder over footings and seal to foundation wall or grade beam with manufacturer's recommended tape.

1. Extend vapor retarder vertically minimum 24 inches (610 mm) above top of footing.

C. Seal around penetrations such as utilities and columns in order to create a monolithic, airtight membrane at grade surface, perimeter, and all vertical penetrations.

3.4 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 07 26 00

SECTION 07 27 20 - AIR BARRIER COATINGS

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 materials and installation of fluid applied waterproof air barrier membrane over vertical above grade concrete walls, concrete masonry walls, and wall sheathing.

B. Related Requirements:

1. Section 03 30 00: Cast-In-Place Concrete

2. Section 04 81 00: Unit Masonry Assemblies

3. Section 06 16 00: Sheathing

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 Auxiliary Material: A transitional component that provides air barrier continuity furnished by a source other than the primary air barrier manufacturer.

D. Air Barrier Assembly: The collection of air barrier materials, accessory and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall

1.4 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference

1. Review air barrier installation requirements and installation details, mock-ups, testing requirements, protection, and sequencing of work.

1.5 COORDINATION/SCHEDULING

A. Coordinate installation of foundation waterproofing, roofing membrane, windows, doors and other wall penetrations to provide a continuous air barrier.

B. Provide protection of rough openings before installing windows, doors, and other penetrations through the wall.

C. Provide sill flashing to direct water to the exterior before windows and doors are installed.

D. Install window and door head flashing immediately after windows and doors are installed.

E. Install diverter flashings wherever water can enter the assembly to direct water to the exterior.

F. Install parapet cap flashing and similar flashing at copings and sill to prevent water entry into the wall assembly.

G. Install cladding within 180 days of waterproof air barrier installation.

1.6 SUBMITTALS

A. Manufacturer's specifications, details and product data.

B. Manufacturer's standard warranty.

C. Manufacturer's ICC evaluation report confirming compliance with the IBC, IRC, and IECC as an air barrier and water-resistive barrier.

D. Samples for approval as directed by architect or owner.

E. Shop drawings: substrate joints, cracks, flashing transitions, penetrations, corners, terminations, and tie-ins with adjoining construction, interfaces with separate materials that form part of the air barrier assembly.

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. Mock-ups

1. Build stand-alone site mock up or sample wall area on as-built construction to incorporate back-up wall construction, typical details covering substrate joints, cracks, flashing transitions, penetrations, corners, terminations, tie-ins with adjoining construction, and interfaces with separate materials that form part of the air barrier assembly.

1.8 PRE-CONSTRUCTION TESTING

A. Conduct testing by qualified test agency.

1. Conduct assembly air leakage testing in accordance with ASTM E 783.

2. Conduct adhesion testing to substrates in accordance with ASTM D 4541.

3. Conduct wet sealant compatibility testing in accordance with sealant manufacturer's field quality control test procedure.

4. Notify design professional minimum 7 days prior to testing.

1.9 DELIVERY, STORAGE AND HANDLING

A Deliver all materials in their original sealed containers bearing manufacturer's name and identification of product.

B. Protect coatings (pail products) from freezing temperatures and temperatures in excess of 90 degrees F (32 degrees C). Store away from direct sunlight.

C. Protect Portland cement based materials (bag products) from moisture and humidity. Store under cover off the ground in a dry location.

D. Protect and store accessory and auxiliary products in accordance with manufacturer's written instructions.

1.10 PROJECT/SITE CONDITIONS

A. Maintain ambient and surface temperatures above 40 degrees F (4 degrees C) during application and drying period, minimum 24 hours after application of waterproof air barrier materials.

B. Provide supplementary heat for installation in temperatures less than 40 degrees F (4 degrees C) or if surface temperature is likely to fall below 40 degrees F (4 degrees C).

C. Provide protection of surrounding areas and adjacent surfaces from application of materials.

1.11 WARRANTY

A. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Sto Corp.

B. Obtain primary air barrier and accessory air barrier materials from single source.

2.2 MATERIALS

A. Basis-of-Design: Primary Air Barrier Material: StoGuard with Sto Gold Coat - ready-mixed flexible spray or roller applied waterproof air barrier membrane material or equal.

B. Accessory Materials

1. Joint and Rough Opening Treatments

   a. Sto Gold Fill® with StoGuard Mesh: ready mixed flexible trowel or spray applied air barrier material.
   b. StoGuard® Rapid Seal™ with StoGuard Mesh: moisture cure elastomeric waterproof air barrier material (mesh not required at rough openings).
   c. Sto Gold Coat with StoGuard Fabric: flexible waterproof air barrier membrane material
   d. StoGuard Tape: self adhering rubberized asphalt tape with polyester fabric facing (for rough openings only).

2. Joint Reinforcements

   a. StoGuard Mesh: nominal 4.2 oz/yd^2 (142 g/m^2) self-adhesive, flexible, symmetrical, interlaced glass fiber reinforcing mesh, with alkaline resistant coating for compatibility with Sto materials.
   b. StoGuard Fabric: non-woven integrally reinforced cloth reinforcement.
   c. StoGuard RediCorner™: non-woven integrally reinforced pre-formed cloth.

3. Transition Membranes

   a. Sto Gold Fill with StoGuard Mesh: ready mixed flexible trowel or spray applied air barrier material with treated glass fiber reinforcing mesh.
   b. StoGuard RapidSeal or StoGuard RapidSeal with StoGuard Mesh: moisture cure elastomeric waterproof air barrier material with treated glass fiber reinforcing mesh (where applicable).
   c. Sto Gold Coat with StoGuard Fabric: flexible waterproof air barrier membrane material with non-woven integrally reinforced cloth.
   d. StoGuard Tape: self adhering rubberized asphalt tape with polyester fabric facing.

4. Primers

   a. StoGuard Primer: rubber resin emulsion primer for use with StoGuard Tape to enhance adhesion and allow installation down to 35 degrees F (1.7 degrees C).

C. Auxiliary Materials

1. Wet sealant: Dow Corning 758, 790, 791, and 795 sealants

2. Pre-cured sealant tape: Dow 123

3. Spray adhesive: 3M Super 77 Spray Adhesive

4. Spray foam: Dow Great Stuff for Gaps and Cracks

D. Patching and Leveling Material for Concrete and Masonry

1. Sto Leveler: polymer modified cementitious patch and leveling material for prepared concrete and masonry surfaces up to 3/8 inch (10 mm).

2. Sto BTS Xtra: polymer modified lightweight cementitious patch and leveling material for prepared concrete and masonry surfaces up to 1/8 inch (3 mm).

2.3 PERFORMANCE REQUIREMENTS

A. Durability, resistance to aging, water and water penetration resistance, structural loading: joint treatment and primary air barrier material, comply with ICC ES AC 212

B. Flexibility: ASTM D 522, primary air barrier material, no cracking or delamination before and after aging using 1/8 inch (3 mm) mandrel at 14° F (10° C)

C. Nail sealability: ASTM D 1970, 7.9.1, primary air barrier passes

D. Material air leakage: ASTM D 2178, primary air barrier and joint treatment $\leq$ 0.004 cfm/ft^2 at 1.57 psf (0.02 L/s·m^2 at 75 Pa)

E. Resistance to mold: ASTM D 3273, no mold growth after 28 day exposure

F. Adhesion: joint treatment and primary air barrier material, ASTM C 297 or D 4541, $\geq$ 30 psi (207 kPa), or exceeds strength of glass mat facing on glass mat gypsum substrates

G. Surface burning: ASTM E 84, joint treatment and primary air barrier material flame spread $\leq$ 25, smoke developed $\leq$ 450, Class A building material

H. Water vapor permeance: ASTM E 96 Method B, > 1 perm (57 ng/Pa·s·m^2)

I. Fire resistance: ASTM E 119, meets requirements for a 1-hour fire-resistive rating when tested with up to 4 inches (102 mm) of continuous foam plastic insulation in a non-load-bearing steel frame wall assembly

J. Fire propagation: NFPA 285, meets requirements for use on all Types of construction with up to 12 inches (305 mm) of continuous EPS foam plastic insulation without height restriction

J. Assembly air leakage: ASTM E 2357, $\leq$ 0.04 cfm/ft^2 (0.2 L/s·m^2) air leakage after conditioning protocol

K. Field adhesion testing: ASTM D 4541, $\geq$ 30 psi (207 kPA) or exceeds strength of glass mat facing on glass mat gypsum substrates

L. Building envelope air leakage: ASTM E 779 or 1827, $\leq$ 0.4 cfm/ft^2 (2 L/s·m^2)

M. Volatile Organic Compounds: SCAQMD Rule 1113, joint treatment and primary air barrier material $\leq$ 100 g/L

N. Water-resistive barrier: ICC ES 212, joint treatment and primary air barrier comply and are listed in a valid ICC ESR.

2.4 DESIGN CRITERIA

A. Structural (Wind and Axial Loads)

1. Design for maximum allowable deflection normal to the plane of the wall: L/240.

2. Design for wind load in conformance with code requirements.

B. Moisture Control

1. Prevent the accumulation of water in the wall assembly and behind the exterior wall cladding:

a. Minimize condensation within the assembly.
b. Drain water directly to the exterior where it is likely to penetrate components in the wall assembly (windows and doors, for example).
c. Provide corrosion resistant flashing to direct water to the exterior in accordance with code requirements, including: above window and door heads, beneath window and door sills, at roof/wall intersections, floor lines, decks, intersections of lower walls with higher walls, and at the base of the wall.

C. Air Barrier Continuity: provide continuous air barrier assembly of compatible air barrier components.

D. Substrates

1. Concrete Masonry Units: provide normal weight units with flush joints (struck flush with the surface) and allow for a minimum of 2 coats of the primary air barrier material, or a cementitious parge coat to fill and level irregular surfaces and 1 coat of the primary air barrier material, prior to the air barrier application, such that a void and pinhole free air barrier surface is achieved.

E. Mechanical Ventilation: maintain pressurization and indoor humidity levels in accordance with recommendations of ASHRAE (see 2005 ASHRAE Handbook—Fundamentals).

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect concrete and concrete masonry surfaces for:

1. Contamination — algae, dirt, dust, efflorescence, form oil, fungus, grease, mildew or other foreign substances.

2. Surface deficiencies – weak, friable, chalkiness, laitance, bugholes, and spalls.

3. Cracks — measure crack width and record location of cracks.

4. Damage or deterioration.

5. Moisture content and moisture damage — use a moisture meter to determine if the surface is dry enough to receive the waterproof air barrier and record any areas of moisture damage or excess moisture.

6. Flush masonry mortar joints completely filled with mortar.

B. Inspect sheathing application for compliance with applicable requirement:

1. Exterior Grade and Exposure I wood based sheathing: E30U-2007, Engineered Wood Construction Guide, and the requirements of the applicable building code.

2. Glass mat faced gypsum sheathing in compliance with ASTM C 1177: consult manufacturer's published recommendations and ICC ES Report. Conform with project requirements for wind load resistance.

3. Cementitious sheathing — Consult manufacturer's published recommendations and ICC ES Report. Conform with project requirements for wind load resistance.

C. Report deviations from the requirements of project specifications or other conditions that might adversely affect the waterproof air barrier installation. Do not start work until deviations are corrected.

3.2 SURFACE PREPARATION

A. Concrete Masonry

1. Remove surface contamination and weak surface conditions. Use chemical cleaners such as TSP (trisodium phosphate) detergent to remove oil and grease and rinse with potable water. Use chemical cleaners to remove efflorescence or other surface contamination in accordance with manufacturer's written instructions. Use mechanical methods such as waterblasting, sandblasting, and wire brushing to remove weak surface conditions.

2. Repair cracks up to 1/8 inch (3 mm) wide by raking with a sharp tool to remove loose, friable material and blow clean with oil-free compressed air. Apply joint treatment material over crack, embed reinforcement (where applicable), and smooth joint treatment material with a trowel, drywall or putty knife to cover the reinforcement.

3. Remove projecting fins, ridges, and mortar by mechanical means. Remove excess mortar from masonry ties, lintels and shelf angles.

4. Fill honeycombs, aggregate pockets, holes and other voids with patching material.

B. Sheathing

1. Remove and replace damaged sheathing.

2. Spot surface defects such as over-driven fasteners, knot holes, or other voids in sheathing with knife grade joint treatment material.

3. Spot fasteners with knife grade or coating joint treatment material.

3.3 INSTALLATION

A. Coordinate work with other trades to ensure air barrier continuity with connections at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line.

B. Rough opening protection:

1. Install transition membrane into and around rough opening. Refer to Sto details 20.03a-e and applicable Sto product bulletins.

C. Sheathing joints

1. Install joint treatment material with applicable reinforcement over sheathing joints. Refer to Sto detail 20.00a and applicable Sto product bulletins.

D. Transitions

1. Install air barrier accessory materials (with reinforcement where applicable), or auxiliary material at transition areas: foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents, windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line. Refer to Sto Tech Hotline No. 0211-BSc and applicable Sto product bulletins.

E. Waterproof air barrier membrane

1. Concrete – install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared concrete substrate. Do not install over working or moving joint sealants.

2. Concrete Masonry - install one liberal coat of Sto Gold Coat by spray or roller in a uniform, continuous film to the prepared concrete masonry substrate. Backroll spray applications. Allow to dry. Install a second liberal coat in a uniform, continuous film, and backroll spray applications, to achieve a void and pinhole free surface. Depending on the condition of the surface a minimum of 10 wet mils up to a maximum of 30 wet mils per coat is required. Apply additional coats if needed to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.

   IMPORTANT NOTE: The number of coats and thickness is highly dependent on CMU composition, unit weight (lightweight or normal weight), porosity, joint profile, and other variables that may exist. For "rough" CMU wall surfaces skim coat the entire wall surface with the leveling material to fill and level the surface prior to applying the waterproof air barrier membrane and transition materials. When a skim coat of the leveling material is installed only one coat of the waterproof air barrier membrane is typically required. Use the mock-up and site tests as the basis for the work.

3. Sheathing

   a. Glass mat faced gypsum sheathing: install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared glass mat gypsum substrate to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.
   b. Plywood sheathing: install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared substrate to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.
   c. OSB sheathing: install one coat of Sto Gold Coat by spray or roller in a uniform, continuous film of 10 wet mils to the prepared substrate and allow to dry. Install a second coat in a uniform, continuous film of 10 wet mils to achieve a void and pinhole free surface. Do not install over working or moving joint sealants.

3.4 FIELD QUALITY CONTROL

A. Owner's qualified testing agency shall perform inspections and tests.

B. Inspections: air barrier materials are subject to inspection to verify compliance with requirements.

1. Condition of substrates and substrate preparation.

2. Installation of primary air barrier material, accessory materials, and compatible auxiliary materials over structurally sound substrates and in conformance with architectural design details, contractor's shop drawings, project mock-up, and manufacturer's written installation instructions.

3. Air barrier continuity and connections without gaps and holes at foundation, floor lines, flashings, lintels and shelf angles, openings and penetrations such as pipes, vents,

windows and doors, masonry anchors, rafters or beams, joints in construction, projections such as decks and balconies, and roof line.

C. Tests: air barrier materials and assembly are subject to tests to verify compliance with performance requirements:

1. Qualitative air leakage test: ASTM E 1186

2. Quantitative air leakage test: ASTM E 779, E 783, and E 1827

3. Adhesion test: ASTM D 4541

4. Qualitative adhesion and compatibility testing: wet sealant manufacturer's field quality control adhesion test

D. Repair non-conforming substrates and air barrier material installation to conform with project requirements.

E. Take corrective action to repair and replace, reinstall, seal openings, gaps, or other sources of air leakage to conform with project performance requirements.

3.5 PROTECTION AND CLEANING

A. Protect air barrier materials from damage during construction caused by wind, rain, freezing, continuous high humidity, or prolonged exposure to sun light.

B. Protect air barrier materials from damage from trades, vandals, and water infiltration during construction.

C. Repair damaged materials to meet project specification requirements.

D. Clean spills, stains, soiling from finishes or other construction materials that will be exposed in the completed work with compatible cleaners.

E. Remove all masking materials after work is completed.

END OF SECTION 07 27 20

Aluminum Plate Rain Screen

SECTION 074100

WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal Wall Panels.

1.2 RELATED SECTIONS

A. Section 054000 - Cold Formed Metal Framing.

B. Section 055000 - Metal Fabrications.

C. Section 072700 - Air Barrier Coatings.

D. Section 076200 - Sheet Metal Flashing and Trim.

E. Section 08410 - Aluminum Entrances & Storefronts.

1.3 REFERENCES

A. AA ASD-1-82 - Aluminum Standards and Data.

B. ANSI A58.1-82 - Minimum Design Loads for Buildings and Other Structures.

C. ANSI H35.1-82 - Alloy and Temper Designation for Aluminum.

D. ASTM B 209 - Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

E. ASTM B 221 - Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

F. IBC - 2004 International Building Code: Section 1609 - Wind Loads.

G. NAAMM - Metal Finishes Manual.

H. AAMA 2605 High performance organic coatings

I. UBC - 1997 - Uniform Building Code: Division III - Wind Design.

1.4 PERFORMANCE REQUIREMENTS

A. Design panels and support system to allow and accommodate expansion and contraction of the various components for temperature differentials of 80 C (175 F). Thermal movement shall not affect, distort, stress or transfer between the panels, support components, or other building elements.

B. Panel and support system design shall meet the following Wind Load Criteria without yield or measurable permanent distortion. Wind loads to be determined per UBC Division III, or IBC Section 1609 Wind Loads.
   1. Basic Wind Speed: As indicated on Drawings.
   2. Exposure: ___.
   3. Maximum panel deflection measured perpendicular to panel face on the longest diagonal length shall not exceed L/60 @ 150 percent maximum wind load.
   4. Maximum deflection of supporting channels or components shall not exceed L/175 of span @ 150 percent maximum wind load. Span is measured between the centerline of anchor points. Cantilever span is defined as two times the distance from anchor centerline to cantilever end.

C. Base design on the Rainscreen Principle. Proper joinery and spacing to allow effective back ventilation and pressure equalization. No exposed sealants, gaskets, tapes or battens unless specifically detailed in Architectural drawings.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Sample Warranty

C. Shop Drawings:
   1. Provide complete shop drawings showing plan views, elevations, and section views that indicate joint locations, terminations, and inter-trade coordination references.
   2. Include large scale details of all typical and all special details that represent intended methods of joinery, bending, and welds, fastening, and interfacing to other finishes.
   3. Provide adequate information to coordinate proper location of the structure's substrate and frame components to which the panel system is attached.
   4. Reference project datum as provided in the Architectural drawings to provide coordinated dimensions and data in order to minimize or eliminate need for field verification.

D. Selection Samples: Finish samples 3 inch by 5 inch (75mm x 125mm) for each different color and product.

E. Verification Samples: For each finish product specified, two samples 8 1/2 inches by 11 inches (225mm x 275mm) on specified project substrate.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of

the same type and scope as specified.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Delivery: Panels and components shall be packaged to adequately protect them from damage in transit and handling.

B. Storing Delivered Product: Store packaged and delivered product under cover. Protect from exposure to weather. Stage crated material on flat surface.

C. Protect all metals from galvanic corrosion and electromotive corrosion through adequate separation or the use of inert insulating materials.

D. Stack materials in assemblies such that oxides and/or electrolytes cannot affect other metals and galvanic action cannot occur.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

A. Materials Manufacturers: Repair or replace defective materials for a period of two (2) years.

B. Panel System Manufacturer: Repair or replace fabricated products which fail due to faulty workmanship for a period of one (1) year.

C. Painted Coatings: Coatings Manufacturer and applicator to warrant paint for a period of ten (10) years. Gloss retention greater than 50 percent. Color retention no greater than 5ÄE Hunter units color loss. Chalk rating of greater than or equal to 8.

D. Panel System Installer: Repair or replace products or components which fail due to faulty workmanship for a period of one (1) year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Abrams Architectural Products, which is located at: 7260 Delta Circle, Austell, GA 30168; Tel: 770-745-8728 Fax: 770-745-8839 or equal.
Email: sales@abramssales.com; Web: www.abramssales.com

B. Fabrication and Installation of panels to be performed by the same fabricator of the panel system. No exceptions allowed.

2.2 MATERIALS

A. Panels: Aluminum Alloy 3003-H14 (paint quality), minimum 3mm (1/8 inch) thickness in accordance with ASTM B 209.

B. Fasteners: All mechanical fasteners to be of Austenitic Stainless Steel. Aluminum rivets may be used only at aluminum to aluminum connections as Engineer's analysis permits.

2.3 FABRICATION

A. Abrams Architectural Products Series AAP – 950 . Exterior metal panels and supporting assemblies, trim and accessories required for complete system installation.
   1. Exterior Panels: Preformed, pre-finished exterior panels. Material as specified in Article 2.2 "Materials".
   2. Vertical Drainage Channels: Matching material and finish providing method for semi concealed panel fastening devices.
   3. Fastening: Semi concealed fastening devices matching color of panels when used in a rainscreen application.
   4. Hardware: Bracketing, anchors and fasteners for attachment of vertical supporting channels to building structure.

B. Manufacturing Tolerances:
   1. Fabricate panels and components to a tolerance not to exceed 1/8 inch (3mm) deviation in any dimension from designed dimension.

C. Defects:
   1. No visible defects to the metal or finish from a distance greater than three (3) Meters (10 feet) when viewed at a 90 degree angle from the surface.
   2. Any blemish that exposes raw metals will be considered defective.
   3. Final acceptance will be determined by the Architect.

2.4 FINISHES

A. Architect to select finish from manufacturers list of available finishes.

B. General: Coatings to be applied in dedicated facility specialized in the application of specified finishes and authorized by the coatings manufacturer. All coatings must meet or exceed the requirements of AAMA 2605.

C. Aluminum Panel Finish: Two (2) coat, 70 percent Kynar fluorocarbon, baked finish.
   1. Color: As selected by Architect from Manufacturers available color choices.

D. Brackets: Mill finish.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions

3.2 EXAMINATION

A. Installing Contractor shall examine the structure and components to support or receive the panel system. Verify that the structure is erected as set forth by the contract documents, and Industry Standards and tolerances. Report deficiencies or discrepancies immediately and do not proceed with erection of panel system until such deficiencies can be corrected or addressed.

B. Verify that structural components are properly placed to receive and support the panel system, and that the panel system accommodates the building tolerances. Report deficiencies immediately.

C. Inspect the integrity of building water proofing envelop. Report inadequacies prior to proceeding.

D. Do not begin installation until substrates have been properly prepared.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.3 INSTALLATION

A. Erect panel system Plumb, Level, and Square, per the contract documents, within tolerances and Industry Standards. Installation tolerances must remain within panel manufacturing tolerances and thermal movement tolerances and requirements.

B. Install in accordance with manufacturer's instructions.

3.4 ADJUSTING AND CLEANING

A. Adjust and secure the panel system to achieve and maintain designed locations and tolerances.

B. Thoroughly clean installed panels for presentation to the General Contractor upon completion of installation. Subsequent cleaning is the responsibility of the General Contractor.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. Present completed and cleaned panel system to the General Contractor as determined in advance. Protection from construction or consequential damage is the responsibility of the General Contractor.

END OF SECTION

SECTION 07 41 20 - FORMED METAL WALL 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:

1. Concealed-fastener, metal wall panels.

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: 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.

B. 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).

C. 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.

D. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.7 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 shown on Drawings 4’-0” x 4’-0”, including corner, supports, attachments, and accessories. Mockup to include section of EIFS, showing condition at interface of metal panel and EIFS, including flashings and sealants.
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. 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.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. 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. 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 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 CONCEALED-FASTENER, METAL WALL PANELS

A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Flush-Profile, Concealed-Fastener Metal Wall Panels.

1. Manufacturers or equal: Subject to compliance with requirements.

a. ATAS International, Inc.
b. Fabral
c. Peterson Aluminum Corporation
d. CENTRIA.

2. Basis of Design Product:

a. ATAS Omawall SKU: OMW188, .063 aluminum x 1-1/2" deep prefinished metal panels with ½" reveal joints.

3. Aluminum Sheet: Coil-coated sheet, ASTM B209 (ASTM B209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
4. Thickness: 0.063 inch
5. Surface: Smooth finish.
6. Exterior Finish: Three-coat fluoropolymer.
7. Color: Refer to Drawings for colors.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Sub-framing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) 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- (25-mm-) thick, flexible closure strips; cut or premolded 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, endwalls, 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 nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C 920; 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 C 1311.

2.4 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 according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 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.

C. Steel Accessories:

1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install sub-framing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.3 METAL PANEL INSTALLATION

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. 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.

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. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. 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.
5. 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 (152-mm) 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 (3 m) with no joints allowed within 24 inches (610 mm) 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 (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

B. Remove and replace metal wall panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.5 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 41 20

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

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. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Roof insulation.

1.3 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color required.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is for roofing system identical to that used for this Project and whose products have been in satisfactory use in similar service for a minimum of 10 years.

B. Installer Qualifications: A qualified firm that shall have a minimum of 10 years of successful installation experience with projects utilizing roofing system specified for this Project and is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roofing, base flashings, roof insulation, fasteners, cover boards, substrate board, roofing accessories, roof pavers, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design or equal: Company and product indicated below by name denotes quality, type, design and characteristic required:

Manufacturers or equal: Subject to compliance with requirements.
1. Firestone Building Products; Ultra Ply TPO Fully Adhered
2. John Manville
3. Carlisle SynTec Sure-Weld TPO

B. Source Limitations: Obtain components including roof insulation, fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 TPO ROOFING

A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.

1. Thickness: 60 mils (1.5 mm) nominal.
2. Exposed Face Color: White.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:

a. Plastic Foam Adhesives: 50 g/L.
b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Single-Ply Roof Membrane Adhesives: 250 g/L.
f. Single-Ply Roof Membrane Sealants: 450 g/L.
g. Nonmembrane Roof Sealants: 300 g/L.
h. Sealant Primers for Nonporous Substrates: 250 g/L.
i. Sealant Primers for Porous Substrates: 775 g/L.
j. Other Adhesives and Sealants: 250 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as TPO sheet.

C. Bonding Adhesive: Manufacturer's standard.

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate, and acceptable to roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Full-spread spray-applied, low-rise, two-component urethane adhesive.

D. Cover Board: Fiberglass mat gypsum roof board equal to DensDeck Prime Roof Board by Georgia Pacific.

E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric, water permeable and resistant to UV degradation, type and weight as recommended by roofing system manufacturer for application.

2.6 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

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 roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.

2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Install insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Install roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

3.5 INSULATION INSTALLATION

A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

3.6 ADHERED ROOFING INSTALLATION

A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.

E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.

H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.10 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <**Insert name of Owner**>.
2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: _____.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

   a. lightning;
   b. peak gust wind speed exceeding: As indicated on Drawings;
   c. fire;
   d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. vapor condensation on bottom of roofing; and

g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07 54 23

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

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 sheet metal flashing and trim in the following categories:

1. Roof-drainage systems.
2. Exposed trim, gravel stops, and fasciae.
3. Copings.
4. Metal flashing.
5. Reglets.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
2. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
3. Division 7 Section "Joint Sealants" for elastomeric sealants.
4. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below:

1. Factory-Painted Aluminum Sheet: ASTM B209, 3003-H14, with a minimum thickness of 0.040

2.2 REGLETS

A. General: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces and compatible with flashing indicated.

B. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

C. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

D. Flexible Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.

E. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of the counterflashing lower edge.

1. Material: Aluminum, 0.024 inch thick.

F. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Fry Reglet Corporation.
2. Hickman: W.P. Hickman Co.
3. Keystone Flashing Company.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

B. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.

C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

E. Epoxy Seam Sealer: 2-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior and interior nonmoving joints, including riveted joints.

F. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

G. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

C. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

D. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

E. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.

1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Gutters with Girth 26 to 30 Inches: Fabricate from the following material:

1. Aluminum: 0.063 inch thick.

C. Downspouts: Fabricate from the following material:

1. Aluminum: 0.024 inch thick.

D. Scuppers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

E. Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.

F. Copings: Fabricate from the following material:

1. Aluminum: 0.050 inch thick.

G. Base Flashing: Fabricate from the following material:

1. Aluminum: 0.040 inch thick.

H. Counterflashing: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

I. Flashing Receivers: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

J. Drip Edges: Fabricate from the following material:

1. Aluminum: 0.0320 inch thick.

2.6 ALUMINUM FINISHES

A. General: Comply with Aluminum Association's (AA) "Designation System for Aluminum Finishes" for finish designations and application recommendations.

B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.

1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

a. Color and Gloss: As selected by Architect from manufacturer's full range of choices for color and gloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, 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 to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.

1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

G. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

H. Install reglets to receive counterflashing according to the following requirements:

1. Where reglets are shown in masonry, furnish reglets for installation under Division 4 Section "Unit Masonry."

I. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches and bed with sealant.

J. Roof-Drainage System: Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the item manufacturer, to drain roof in the most efficient manner. Coordinate roof-drain flashing installation with roof-drainage system installation. Coordinate flashing and sheet metal items for steep-sloped roofs with roofing installation.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07 62 00

SECTION 07 72 00 - ROOF ACCESSORIES

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. Roof curbs.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood cants, and wood nailers.
2. Division 7 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details for roof accessories. Show layouts of roof accessories including plans and elevations. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other work.

C. 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.

D. Samples: For each type of exposed factory-applied color finish required and for each type of roof accessory indicated, prepared on Samples of size to adequately show color.

E. Warranty: Manufacturer’s Warranty and Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Sheet Metal Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.

B. American Society for testing and Materials ASTM A 36-93a: Standard Specification for Structural Steel.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship roof accessories properly labeled in heavy-duty packaging to prevent damage (manufacturer’s original packaging).

B. Store materials in a dry, protected, well-vented area. The contractor shall thoroughly inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier’s freight bill of lading.

C. Remove protective wrapping immediately after installation, if applicable.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify required openings for each type of roof accessory by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Mounting surfaces shall be straight and secure; substrates shall be of proper width.

C. Refer to the construction documents, shop drawings, and manufacturer’s installation instructions.

D. Observe all appropriate OSHA safety guidelines for this work.

1.7 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.

1. With Architect's approval, adjust location of roof accessories that would interrupt roof drainage routes and roof expansion joints.

1.8 WARRANTY

A. Manufacturer’s standard warranty: Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers listed in other Part 2 articles.

2.2 METAL MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coated and mill phosphatized for field painting.

B. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.

C. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by manufacturer for type of use and mill finish, unless otherwise indicated.

1. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: Nonspecular as fabricated; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker) complying with AAMA 611.

a. Color: Medium bronze.

D. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use, mill finished.

E. Galvanized Steel Tube: ASTM A 500, round tube, hot-dip galvanized to comply with ASTM A 123/A 123M.

F. Galvanized Steel Pipe: ASTM A 53/A 53M.

2.3 MISCELLANEOUS MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C 1289, 1 inch (25 mm) thick.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by roof accessory manufacturer. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C 920, polyurethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

H. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.4 ROOF CURBS

A. Roof Curbs: Provide metal roof curbs, internally reinforced and capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Fabricate with welded or sealed mechanical corner joints, with integral metal cant and integral formed mounting flange at perimeter bottom. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported. Provide at all roof penetrations larger than a single pipe.

1. Manufacturers or equal: Subject to compliance with requirements:
   a. Custom Curb, Inc.
   b. Loren Cook Company.
   c. Metallic Products Corporation.
   d. Pate Company (The).
   e. Roof Products & Systems Corporation.
   f. ThyCurb; Div. of Thybar Corporation.
   g. Uni-Curb, Inc.
2. Roof curbs shall be premanufactured to fit rooftop equipment or to match the condition occurring on the roof and shall be coordinated with roof slopes, configurations, and insulation thicknesses for each condition.

3. Curb height may be determined by adding thickness of roof insulation and minimum base flashing height recommended by roofing membrane manufacturer. Fabricate units to minimum height of 8 inches, unless otherwise indicated.
4. Roof curbs shall be constructed with the following requirements:
   1. Material: Heavy-gauge galvanized steel, with internal reinforcing of 1" x 1" x 1/8" steel angles on sides 36" long or greater: minimum 18 gauge (14 gauge for curbs supporting equipment, or thicker where required per engineer's calculations).
   2. Construction: Fully welded and mitered corner seams. All curbs to have integral base. Minimum height above roof shall be 8", and shall be constructed to match roof slopes.
   3. Insulation: 1½" thick semi-rigid fiberglass insulation, minimum 3 psf density.
   4. Nailers: 2 x 2 nominal pressure-treated wood nailers continuous around top of curb.
5. Integral cants: Where indicated on drawings or required by roofing system, provide integral 3" cants built into the roof curb. Raise cant to a height as required to clear roof insulation.

2.6 ROOF PENETRATION BOOTS: Flexible, premanufactured graduated boots molded of thermoplastic with UV inhibitors and having at least two (2) stainless steel pipe clamps per boot.

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Portals Plus, Inc.

   b. Roofing membrance manufacturer

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 work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored and is ready to receive roof accessories.
2. Verify dimensions of roof openings for roof accessories.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions. Anchor roof accessories securely in place and capable of resisting forces specified. Use fasteners, separators, sealants, and other miscellaneous items as required for completing roof accessory installation. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Install roof accessories to fit substrates and to result in watertight performance and insect resistant.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing exposed-to-view components of roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene underlayment.
3. Bed flanges in thick coat of asphalt roofing cement where required by roof accessory manufacturers for waterproof performance.

D. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.

E. Roof Curb Installation:

1. Set roof curb so top surface of roof curb is level.

F. Preformed Flashing Installation:

1. Secure to roof membrane according to vent and stack flashing manufacturer's written instructions.

G. Seal joints with elastomeric sealant as required by manufacturer of roof accessories.

3.3 TOUCH UP

A. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Division 9 painting Sections.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

END OF SECTION 07 72 00

SECTION 07 90 00 - JOINT SEALANTS

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 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

C. Primers and backer rods.

D. All material, tools and labor necessary to perform all caulking and weather sealing operations not specifically described in other Sections. Requirements include, but are not limited to the following:
   1. Joints around door, window and louver frames or other openings (inside and outside).
   2. Openings in concrete, including isolation and expansion joints.
   3. Beneath thresholds apply full bed of sealant.
   4. Penetrations of exterior walls by piping or conduit.
   5. Expansion joints.
   6. Control joints as required.
   7. At all junctures of dissimilar materials.
   8. All other locations where indicated or required to provide a weatherproof or finished condition, including those locations where caulking or sealant is required as part of best construction industry practices, whether shown on the Drawings or not.

1.3 RELATED SECTIONS

A. Division 3 Section “Cast-In-Place Concrete” for isolation and expansion joint construction.
B. Division 4 Section “Unit Masonry” for control joint and relief joint construction.
C. All Divisions and Sections where sealants and/or caulking are referenced.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C321 – Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
   2. ASTM C834 – Standard Specification for Latex Sealants.
   3. ASTM C882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
   4. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.
   5. ASTM C920 – Standard Specification for Cylindrical Sealant Backing for Use with Cold

Liquid Applied Sealants.

6. ASTM C1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

B. FS (Federal Specification) Interim Federal Specification for Sealing Compound:

1. TT-S-00227E (COM-NBS) – Elastomeric Type, Multi-Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
2. FS (Federal Specification) TT-S-00230C – Elastomeric Type, Single Component (for Caulking, Sealing, and Glazing in Buildings and Other Structures).
3. FS (Federal Specification) TT-S-001543 (COM-NBS) Silicone Rubber Base (for Caulking, Sealing, and Glazing in Buildings and Other Structures)>

1.5 SUBMITTALS

A. Submit under provisions of Division 1 Section "Submittals."

B. Manufacturer's Technical Data Guides, complete range of colors for Architect selection, and written application procedures.

C. Submit samples illustrating colors selected.

D. Submit laboratory tests or data validating product compliance with performance criteria specified.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company regularly engaged in manufacturing and marketing of products specified in this section.

B. Installer Qualifications: Qualified to perform work specified with a minimum of 10 years of successful installation experience with projects utilizing sealant products provided by product manufacturer. Applicator shall be a company with sufficient resources and experience to provide labor and supply material for repairs or rework necessary under the Warranty provisions of these specifications.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product.

B. Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight in strict accordance with manufacturer's recommendations. Prevent contamination by foreign matter or damage of materials due to improper storage or exposure. Remove from the project site any material showing evidence of damage or exposed to improper conditions.

C. Condition products to approximately 60° to 70°F (16° to 21°C) for use in accordance with manufacturer's recommendations.

D. Handle all products with appropriate precautions and care as stated on Material Safety Data

Sheet.

1.8 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4 deg C).
2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.9 WARRANTY

A. Provide manufacturer's five (5) year standard warranty for each type of sealant provided.

B. Include coverage for replacement of sealant materials which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

C. Warranty Exclusions: Failure resulting from concrete shrinkage, structural cracks or defects, faulty construction, faulty design, faulty materials (other than joint filler), misuse of structure, settlement, or accident, fire or other casualty of physical damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to full compliance with all requirements:
1. Dow Corning Corp.
2. General Electric Co.
3. Pecora Corp.
4. Sonneborn® Building Products, ChemRex, Inc.
5. Tremco
6. United States Gypsum (interior acoustical sealant only)

B. Other manufacturers with similar products meeting all requirements may be acceptable upon complete data submittal and Architect approval prior to Bidding in accordance with Division 1.

C. Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under service and application conditions, as demonstrated by testing and field experience.

D. Colors: Provide color indicated of exposed joint sealants or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

E. Provide all joint sealers of the same type from a single manufacturer.

2.2 MATERIALS

A. Single Component, Polyurethane Sealant: Plus or minus 25 percent, joint movement capability; ASTM C920, Type S, Grade NS, Class 25, uses NT, M, A, and O; FS TT-S-00230C.

B. Multi-Component, Polyurethane Sealant: Plus or minus 25 percent joint movement capability; ASTM C920, Type M, Grade NS, Class 25, uses NT, M, A, and O; FS TT-S-oo227E.

C. Self-Leveling Polyurethane Sealant: Plus or minus 25 percent joint movement capability for horizontal joints; ASTM C920, Type M, Grade P, Class 25, uses T, M, and O; FS TT-S-0227E; USDA approved.

D. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, uses NT, A, and M; FS TT-S001543 (COM-NBS); USDA approved.

E. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, uses NT, G, and A; FS TT-S-001543 (COM-NBS); plus or minus 25 percent joint movement capability.

F. Polysulfide Sealant:: ASTM C920, Type M, Grade NS and FS TT-S-00227 (COM-NBS); plus or minus 25 percent joint movement capability, USDA approved.

2.3 ACCESSORIES

A. Low VOC Primer: Solvent based with low VOC's, as recommended by manufacturer.

B. Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.

C. Soft Backer Rod: Non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants and approved by sealant manufacturer.
1. Comply with ASTM C130
2. Size required for joint design.

D. Closed-Cell Backer Rod: Closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications and approved by sealant manufacturer.
1. Comply with ASTM C1330.
2. Size required for joint design.

E. Joint Filler: Closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than ¼" (6mm) and approved by manufacturer.
1. Size required for joint design.

F. Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

G. Tape Sealant.
1. Solvent-free, butyl-based tape sealant with a solids content of 100 percent formulated to be nonstaining, paintable, and nonmigrating in contact with nonporous surfaces with or without reinforcement thread to prevent stretch and packaged on rolls with release paper on one side

H. Preformed Foam Sealant.

1. Preformed, precompressed, open-cell, high-density urethane foam sealant impregnated with a nondrying, water-repellant agent; in precompressed sizes and in roll or stick form to fit joint widths indicated; permanently elastic, mildew-resistant, nonmigratory, nonstaining, compatible with joint substrates and other joint sealants.

2.4 COLOR

A. Sealant Colors: Selected by Architect from manufacturer's complete range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect all areas involved in work to establish extent of work, access, and need for protection of surrounding construction.

B. Protect all surroundings from flexible epoxy joint filler including, but not limited to, floors, equipment, line striping, walkways, and drives.

C. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer 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 concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces where required at horizontal traffic conditions, apply two (2) coats of primer for best results.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    a. Install appropriate size backer rod, larger than joint where necessary according to manufacturer’s recommendations, typically 30%to 50% compression. Depress backer rod half the width of the joint.
    b. Install polyethylene joint filler in joints wider than ¼” (6mm) to back-up material per manufacturer’s recommendations.
    c. Do not leave gaps between ends of joint fillers.
    d. Do not stretch, twist, puncture, or tear joint fillers.
    e. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints. Install per manufacturer’s recommendations.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant

backings are installed.

F. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
2. Provide flush joint configuration, per Figure 5B in ASTM C 1193, where indicated.

    a. Use masking tape to protect adjacent surfaces of recessed tooled joints.

3. Provide recessed joint configuration, per Figure 5C in ASTM C 1193, of recess depth and at locations indicated.

G. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, and to comply with sealant manufacturer's directions for installation methods, materials, and tools that produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in conformance with sealant manufacturer's recommendations.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur. Leave all finished work in a neat, clean condition.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 SCHEDULE OF JOINT SEALERS

A. General Purpose Interior and Exterior Applications
1. Sealant
    a. Silicone
2. Applications:
    a. Joints and recesses between adjacent constructions and frames, sills, and subsills of windows, doors, curtainwall, storefront and louvers.
    b. Coping joints and wash joints in precast concrete, cast stone, or natural stone.
    c. Masonry joints beneath shelf angles and concrete structure.

d. Around penetrations in exterior walls.
e. Under door thresholds and at bottom of door frames.
f. Where necessary to prevent infiltration of water or air into or through exterior building envelope.
g. Non-traffic applications.

B. Exterior Tilt-Up Concrete Panel
1. Sealant:
a. Primer-less single-component polyurethane
2. Applications:
a. Between adjacent tilt-up concrete panels

C. Other Exterior Applications:
1. Sealant:
a. Single or multi-component polyurethane.
2. Applications:
a. Between adjacent construction and gravel stops, copings, fascias, and miscellaneous flashings.
b. Metal flashings inserted into reglet.
c. Top edges of surface mounted counterflashing.
d. Expansion and control joints in masonry where expansion joint covers are not indicated.
e. Joints between new masonry and concrete construction.
f. Non-traffic applications.

D. Interior Wetted Areas:
1. Sealant: Silicone, anti-microbial, fungus resistant.
2. Applications: Between adjacent construction and vanities, shower stalls, bathtub and shower enclosures, sinks, countertops, plumbing cut-outs, and plumbing fixtures.
3. Non-traffic applications.

E. Interior High-Movement Joints:
1. Sealant:
a. Silicone.
2. Applications:
a. At resilient joint between interior partitions and floor framing above.
b. Non-traffic applications.

F. Exterior Traffic Surfaces:
1. Sealant:
a. Two component self-leveling polyurethane.
2. Applications:
a. Control and expansion joints in sidewalks and pavements.
b. Isolation joints.

G. Interior Traffic Surfaces:
1. Sealant:
a. Two component self-leveling polyurethane.
2. Applications:
a. Control and expansion joints in floors.
b. Multi-movement floor joints.

1. Interior Tilt-up concrete panel joints:
1. Sealant:
a. Acrylic latex
2. Applications
a. Joints between adjacent tilt up panels

END OF SECTION 07 90 00

SECTION 08 11 00 - STEEL 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes steel doors and frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 8 Section “Stile and Rail Wood Doors” for wood doors installed in steel frames.
2. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
3. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.

1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Steel Doors and Frames:

a. Amweld Building Products, Inc.
b. Benchmark Commercial Doors.
c. Ceco Door Products.
d. Steelcraft.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569

B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 commercial quality, or ASTM A 620 drawing quality, special milled.

C. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 commercial quality, or ASTM A 642 drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 coating designation, mill phosphatized.

D. Supports and Anchors: Fabricated from not less than 0.0478-inch- thick steel sheet; 0.0516-inch-thick galvanized steel where used with galvanized steel frames.

E. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

A. Steel Doors: Provide 1-3/4-inch- thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:

1. Exterior Doors: Grade III, extra heavy-duty, Model 2, seamless design, minimum 0.0635-inch- thick galvanized steel sheet faces.
   a. Core: Polyisocyanurate

B. Interior Metal Doors and Frames: NAAMM-HMMA 861.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches
   c. Face: Uncoated cold-rolled steel sheet, minimum thickness of 0.042 inches.
   d. Edge Construction: Continuously welded with no visible seam.
   e. Core: Steel stiffened.
3. Frames:
   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inches.
   b. Construction: Face welded.
4. Exposed Finish: Prime

2.4 FRAMES

A. Provide metal frames for doors, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.0478-inch- thick cold-rolled steel sheet.
1. Fabricate frames with mitered or coped and continuously welded corners.
2. Fabricate frames for interior openings over 48 inches wide from 0.0598-inch- thick steel sheet.
3. Form exterior frames from 0.0635-inch- thick galvanized steel sheet.

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 0.0179-inch- thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

1. Clearances: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between non-fire-rated pairs of doors. Not more than 3/4 inch at bottom.

   a. Fire Doors: Provide clearances according to NFPA 80.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.

1. At exterior locations and where indicated.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

J. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for steel sheet finishes.

C. Apply primers to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied

over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply

air-dried primer specified below immediately after cleaning and pretreatment.

1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

2.8 STEEL SHEET FINISHES

A. Surface Preparation: Solvent-clean surfaces to comply with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel to comply with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling).

B. Pretreatment: Immediately after surface preparation, apply a conversion coating of type suited to organic coating applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer that complies with ANSI A224.1 acceptance criteria, is compatible with finish paint systems indicated, and has capability to provide a sound foundation for field-applied topcoats. Apply primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1. Place frames before constructing enclosing walls and ceilings.
2. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors. Grout frames solid.
3. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
4. Install fire-rated frames according to NFPA 80.

C. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in ANSI/SDI 100.

1. Fire-Rated doors: Install with clearances specified in NFPA 80.

3.2 ADJUSTING AND CLEANING

A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08 11 00

SECTION 08 21 10 - FLUSH WOOD DOORS

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-core doors with wood veneer faces for transparent finish.

B. Related Requirements:

C.

1. Section 088000 "Glazing" for glass view panels in flush wood doors.
2. Section 081100 "Steel Doors and Frames" for door frames.
3. Section 087100 "Door Hardware" for finish hardware in flush wood doors.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction louvers, and trim for openings.

B. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Fire-protection ratings for fire-rated doors.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is a certified participant in AWI's Quality Certification Program.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.8 WARRANTY

A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Exterior Doors: Two years from date of Substantial Completion.
4. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, doors may be provided but not limited to the following:
1. Solid Core Doors:

Manufacturers or equal: Subject to compliance with requirements.

a. Algoma Hardwoods, Inc.

b. Eggers Industries, Architectural Door Division
c. Graham Manufacturing Corp.
d. Ampco, Inc.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards".

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
2. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

C. Fire-Rated Wood Doors: Doors 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 NFPA 252.

1. Temperature-Rise Limit: At vertical exit enclosures 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. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.

D. Particleboard-Core Doors:

1. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade LD-2 or M-2, except for density.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:

a. 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
b. 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
c. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.

3. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

E. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf (3100 N).
b. Screw Withdrawal, Edge: 400 lbf (1780 N).

F. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

G. Hollow-Core Doors:

1. Construction: Standard hollow core.
2. Blocking: Provide wood blocking with minimum dimensions as follows:

a. 5-by-18-inch (125-by-460-mm) lock blocks at both stiles.
b. 5-inch (125-mm) top-rail blocking.
c. 10-inch (250-mm) bottom-rail blocking.
d. 2-1/2-inch (64-mm) midrail blocking.

2.3 DOORS FOR TRANSPARENT FINISH

A. Interior Doors WD Manufacturers or equal: Subject to compliance with requirements:

1. Masonite Architectural Aspiro Series
2. Performance Grade: ANSI/WDMA I.S. 1A Heavy Duty
3. Performance Grade:

a. ANSI/WDMA I.S. 1A Heavy Duty unless otherwise indicated on Drawings.

4. Architectural Woodwork Standards Grade: Custom.
5. Faces: Single-ply wood veneer not less than 1/50 inch (0.508 mm) thick.

a. Species: White oak.
b. Cut: Plain sliced
c. Finish: To be selected by architect from manufacturer's full range
d. Match between Veneer Leaves: Slip match.
e. Assembly of Veneer Leaves on Door Faces: Balance match.
f. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
g. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet (3 m) or more.
h. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.

6. Exposed Vertical Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A.

    a. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

        1) Screw-Holding Capability: [475 lbf (2110 N)] in accordance with WDMA T.M. 10.

7. Core for Non-Fire-Rated Doors:

    a. ANSI A208.1, Grade LD-1 particleboard.

        1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware'

        2) Provide doors with glued-wood-stave or WDMA I.S. 10 structural-composite-lumber cores instead of particleboard cores for doors scheduled to receive exit devices in Section 087100 "Door Hardware."

    b. Glued wood stave.

    c. WDMA I.S. 10 structural composite lumber.

    d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.

8. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.

9. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES

A. Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory primed for paint finish.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

    1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

    1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

C. Openings: Factory cut and trim openings through doors.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

D. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before shop priming.

1. Flash top of outswinging doors with manufacturer's standard metal flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 087100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide1/4 inch (6.4 mm) from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.
b. 2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.

2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 08 21 10

SECTION 08 33 13 - COILING COUNTER DOORS

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. Counter door assemblies.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for door-opening framing and corner guards.
2. Section 099123 "Interior Painting" for finish painting of factory-primed doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic closing device and testing and resetting instructions.

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. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. 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.

1.4 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.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

B. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS OR EQUAL

A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.

1. Obtain operators and controls from coiling counter door manufacturer.

2.2 COUNTER DOOR ASSEMBLY

A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.

1. Wayne Dalton

2. Overhead Door

B. Operation Cycles: Door components and operators capable of operating for not less than 10,000. 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.

1. Include tamperproof cycle counter.

C. Door Curtain Material: Stainless steel.

D. Door Curtain Slats: Flat profile slats of 1-1/2-inch center-to-center height.

E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated stainless steel and finished to match door.

F. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise

G. Hood: Match curtain material and finish or Stainless steel.

1. Mounting: Between jamb.

H. Sill Configuration: No sill

I. Locking Devices: Equip door with slide bolt for padlock and chain lock keeper.

1. Locking Device Assembly: locking bars, operable from inside with thumbturn.

J. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Front of hood Retain one of two options in "Motor Exposure" Subparagraph below or revise to suit Project. The operating environment, including hazardous conditions, may require other motor types and enclosure modifications.
3. Motor Exposure: Interior
4. Motor Electrical Characteristics:

a. Horsepower: 1/2 hp.
b. Voltage:

1) 115-V ac 208-V ac 230-V ac, single phase, 60 Hz.
2) 208-V ac 230-V ac 460-V ac, three phase, 60 Hz.

5. Emergency Manual Operation: Push-up type.
6. Obstruction-Detection Device: Automatic pneumatic sensor edge on bottom bar.

a. Sensor Edge Bulb Color: Black

7. Control Station(s): Interior-side mounted

K. Curtain Accessories: Equip door with pull-down strap.

2.3 MATERIALS, GENERAL

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.4 DOOR CURTAIN MATERIALS AND FABRICATION

A. Door Curtains: Fabricate coiling counter door curtain of interlocking metal slats 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. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.

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.

2.5 HOODS

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
   1. Stainless Steel: 0.025-inch- (0.64-mm-) thick, stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.

B. Integral Frame, Hood, and Fascia: Welded sheet metal assembly of the following sheet metal(s):

C. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.6 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. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

   1. Lock Cylinders: As standard with manufacturer and keyed to building keying system.
   2. Keys: Two for each cylinder.

C. Chain Lock Keeper: Suitable for padlock.

D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.7 CURTAIN ACCESSORIES

A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.

B. Weatherseals: Equip door with weather-stripping gaskets fitted to entire perimeter of door for air-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 nylon brushes <Insert material>.

C. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

D. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

E. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches (2130 mm) high.

F. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches (2130 mm) high.

G. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Testing for manually operated doors shall allow resetting by opening the door without retensioning the counterbalance mechanism. Release mechanism for motor-operated doors shall allow testing without mechanical release of the door. Automatic-closing device shall be designed for activation by the following:

1. Replaceable fusible links with temperature rise and melting point of 165 deg F (74 deg C) interconnected and mounted on both sides of door opening.
2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
4. Building fire-detection, smoke-detection, and -alarm systems.

2.8 COUNTERBALANCE MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, seamless or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic closing device operates.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 MANUAL DOOR OPERATORS

A. General: Equip door with manual door operator by door manufacturer.

B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf (111 N)

C. 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) 30-lbf (133-N) force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.

D. Crank Operator:

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.
1. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required

for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.

D. Motors: Reversible-type motor for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Type: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.11 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 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611,AA-M12C22A31, Class II, 0.010 mm or thicker.

C. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.14 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

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 coiling counter 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 coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Fire-Rated Doors: Install according to NFPA 80.

D. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include12 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 shall be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance, including emergency callback service, during normal working hours.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 08 33 13

SECTION 08 33 23 - OVERHEAD COILING DOORS AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.
2. Section 099000 "Painting" for finish painting of factory-primed doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. 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.
8. Open-curtain grille with full-size components consisting of rods, spacers, and links as required to illustrate each assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Special warranty.

B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

C. Record Documents: List of door numbers and applicable room name and number to which door accesses.

1.6 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.

1.7 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 OR EQUAL

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-door manufacturer.
   a. Wayne Dalton
   b. Overhead Door

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

B. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:

1. Design Wind Load: As indicated on Drawings
2. Testing: According to ASTM E330/E330M
3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

2.3 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

B. Operation Cycles: Door components and operators capable of operating for not less than 20,000. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

C. Air Infiltration: Maximum rate of 1.0 cfm/sq. ft. (5.1 L/s at 15 and 25 mph (24.1 and 40.2 km/h) when tested according to ASTM E283

D. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu

E. Door Curtain Material: Galvanized steel.

F. Door Curtain Slats: Flat profile slats of 1-7/8-inch (48-mm) Features in "Perforated Slats," "Fenestrated Slats," and "Vision Panels" subparagraphs below are available for service doors from some manufacturers for specific slat materials and profiles. Verify availability and size with manufacturer; revise to suit Project.
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 First option in "Shape" Subparagraph below is standard. Verify availability of second option with manufacturer.

1. Shape: Round
2. Mounting: Face of wall

J. Locking Devices: Equip door with slide bolt for padlock locking device assembly and chain lock keeper.

1. Locking Device Assembly: Single-jamb side locking bars, operable from

K. Electric Door Operator:

1. Usage Classification: Standard duty, up to 25 cycles per hour and up to 90 cycles per day.
2. Operator Location: Wall Bench
3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet (2.44 m) or lower.
4. Motor Exposure: Interior.
5. Motor Electrical Characteristics:

a. Horsepower: 1 2 3 hp.
b. Voltage: 115-V ac single phase, 60 Hz.
c. Voltage: 208-V ac three phase, 60 Hz.

6. Emergency Manual Operation: Push-up type.
7. Obstruction-Detection Device: Automatic photoelectric sensor pneumatic sensor edge on bottom bar.

a. Sensor Edge Bulb Color: Black

8. Control Station(s): Interior mounted

L. Curtain Accessories: Equip door with weatherseals.

M. Door Finish:
1. Factory Prime Finish: Manufacturer's standard color.
2. Stainless Steel Finish: ASTM A480/A480M No. 2B (bright, cold rolled) ASTM A480/A480M No. 4 (polished directional satin) <Insert finish>.
3. 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.

B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

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. Chain Lock Keeper: Suitable for padlock.

C. 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, nylon brushes.

B. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

C. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

D. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches (2130 mm) high.

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 or welded carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load.

C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.

2. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.

D. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated for each door assembly.

1. Electrical Characteristics: Minimum as indicated for each door assembly. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel. For fire-rated doors, activation delays closing.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.

2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

    a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.

G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."

1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N) 30 lbf (133 N)

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.

L. Portable Radio-Control System: Consisting of one two of the following per door operator:

1. Three-channel universal coaxial receiver to open, close, and stop door.
2. Portable control device to open and stop door may be momentary-contact type; control to close door shall be sustained- or constant-pressure type.
3. Remote-antenna mounting kit.

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 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

C. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.14 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

1. Run grain of directional finishes with long dimension of each piece.
2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
3. Directional Satin Finish: ASTM A480/A480M No. 4.

C. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

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

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 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 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 08 41 00 - ALUMINUM ENTRANCES AND STOREFRONTS

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. Exterior storefront systems.
2. Exterior manual swing aluminum doors.

B. Related sections include the following:

1. Division 7 Section "Joint Sealants" for joint sealants installed as part of aluminum entrance and storefront systems.
2. Division 8 Section "Glazing."
3. Division 8 Section “Glazed Aluminum Curtain Walls”

1.3 SYSTEM DESCRIPTION

A. General: Provide aluminum entrance and storefront systems capable of withstanding loads and thermal and structural movement requirements indicated without failure, based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Glazing: Physically and thermally isolate glazing from framing members.

C. Dimensional Tolerances: Provide entrance and storefront systems that accommodate dimensional tolerances of building frame and other adjacent construction.

1.4 SUBMITTALS

A. Shop Drawings: For storefront systems. Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform work of this Section who has specialized in installing entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 WARRANTY

A. Special Warranty: Submit a written warranty executed by the manufacturer agreeing to repair or replace components of entrance and storefront systems that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including, but not limited to, excessive deflection.
2. Adhesive sealant failures.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Failure of operating components to function normally.
5. Water leakage through fixed glazing and frame areas.

B. Warranty Period: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following (or approved equal):

1. Kawneer Company, Inc.
2. Oldcastle Building Envelope.
3. YKK Architectural Products America, Inc.
4. Model numbers and design series specified are standard components by Kawneer Company, Inc. as a Basis of Design. Other specified manufacturers are acceptable providing they are of equal size, configuration, color and quality.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.

1. Sheet and Plate: ASTM B 209.
2. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Bars, Rods, and Wire: ASTM B 211.
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Complying with ASTM A 36 for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 for hot-rolled sheet and strip.

C. Glazing as specified in Division 8 Section "Glazing."

D. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.

E. Spacers, Setting Blocks, Gaskets, and Bond Breakers: Manufacturer's standard permanent, nonmigrating types in hardness recommended by manufacturer, compatible with sealants, and suitable for system performance requirements.

F. Framing system gaskets, sealants, and joint fillers as recommended by manufacturer for joint type.

G. Sealants and joint fillers for joints at perimeter of entrance and storefront systems as specified in Division 7 Section "Joint Sealants."

H. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.

2.3 STOREFRONT FRAMING

A. Storefront systems based on products by Kawneer Company, Inc. or approved equal. See drawings for location of each system:

1. Exterior: IR 501 T, 2 ¾" x 5" Zone 4, Level E, designed to accommodate 1" insulated glazing., thermally broken, outside glazed and capable of structural silicone glazing of horizontal joints.

2. Interior: TRIFAB 451, 2" x 4 ½", designed to accommodate 1/4" clear tempered glazing.

2.4 COMPONENTS

A. Doors: Provide manufacturer's standard 1-3/4 inch thick glazed doors with minimum 0.125-inch-thick, extruded tubular rail and stile numbers. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.

1. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded aluminum glazing stops and preformed gaskets.
2. Stile Design: Medium stile.

B. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to retain fastener threads.

2. Do not use exposed fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123 or ASTM A 153 requirements.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.

F. Storefront Sill Flashing: Fabricate sill flashing of 24-gauge sheet, finished to match aluminum storefront.

1. Form aluminum sheet to form three sided "pan" for storefront sill. Extend leading, open side as detailed.

2.5 HARDWARE

A. General: See Division 8 section, “Finish Hardware” for hardware scheduled for aluminum entrances. When necessary to supplement sets scheduled in the Finish Hardware section, provide hardware to comply with the following specifications. Provide heavy-duty hardware units indicated in sizes, number and type recommended by manufacturer for entrances indicated. Finish exposed parts to match door finish, unless otherwise indicated.

B. Offset Pivots: ANSI/BHMA A156.1 Grade 1 with exposed parts of cast-aluminum alloy. Provide top, bottom and intermediate pivots at each door leaf.

C. Ball-Bearing Butts: ANSI/BHMA A156.1 Grade 1, 5-knuckle, 4-1/2 inch (101.6-by-114.3-mm) ballbearing butts. Provide nonremovable pins at hinges exposed to door outside and provide nonferrous hinges for applications exposed to weather. Provide 3 hinges at each leaf for doors up to 36 inches (914 mm) wide and 80 inches (2032 mm) tall; provide 4 hinges at each leaf for taller doors.

D. Closers, General: Comply with manufacturer’s recommendations for closer size, depending on door size, exposure to weather, and anticipated frequency of use.

1. Closing Cycle: Comply with requirements of authorities having jurisdiction or the Americans With Disabilities Act (ADA), “Accessibility Guidelines for Buildings and Facilities (ADAAG), whichever are more stringent.

2. Opening Force: Comply with the following maximum opening-force requirements for locations indicated:

a. Exterior Doors: 15 lbf (67 N).
b. Interior Doors: 5lbf (22.2N).

E. Concealed Overhead Closers: ANSI/BHMA 156.4, Grade 2, and as follows:

1. Type: single acting, independently hung, with concealed arm and track.
2. Hold Open: No hold open function.

3. Back Check: Adjustable.
4. Positive Dead Stop: Coordinated with hold-open angle, if any, or at angle selected by Architect from manufacturer's standard options.

F. Concealed Overhead Holders: ANSI/BHMA A156.8, Grade 1, adjustable, shock-absorbing type, for use with single-or double-acting doors.

G. Cylinders: As specified in Division 8 Section "Door Hardware."

H. Thumb Turns: Manufacturer's standard cast-aluminum-alloy, inside thumb-turn cylinders.

I. Cylinder Guard: Manufacturer's standard hardened-steel security ring with retainer plate for inside stile wall that protects lock cylinder from removal by wrenches, prying, or sawing.

J. Deadlock: Manufacturer's standard mortise deadlock with minimum 1-inch long throw bolt and complying with ANSI/BHMA A156.5, Grade 1 requirements.

1. Three-Point Locking: Provide top and bottom bolts and mechanism that automatically throws inactive-leaf top bolt into frame head and active-leaf bottom bolt into threshold when deadlock engages inactive leaf and provides one-stage unlocking.

K. Flat Face Strikes: Manufacturer's standard stainless-steel, flat face strike with steel mounting plate and black-plastic dustbox.

L. Pull Handles: Vertical back-to-back 1" diameter, satin stainless steel pull, 18" high.

M. Push Bars: 1" diameter, satin stainless steel push bar.

N. Thresholds: At exterior doors, provide manufacturer's standard threshold with cutouts coordinated for operating hardware, with anchors and jamb clips, and not more than ½-inch high, with beveled edges providing a floor level change with a slope of not more than 1:2 with integral dam, and in the following material:
1. Material: Aluminum, mill finish.

O. Weather Sweeps: Manufacturer's standard sweep for application to exterior door bottoms and with concealed fasteners on mounting strips.

2.6 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

B. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
C. Prepare components to receive concealed fasteners and anchor and connection devices.

D. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

E. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to FGMA's "Glazing Manual."

F. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

G. Storefront: Fabricate framing in profiles indicated for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

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 the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class 1, 0.018mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing entrance and storefront systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

D. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Division 7 Section "Joint Sealants."

E. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

F. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturer's written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.

G. Install glazing to comply with requirements of Division 8 Section "Glazing," unless otherwise indicated.

H Install perimeter sealant to comply with requirements of Division 7 Section "Joint Sealants," unless otherwise indicated.

I Erection Tolerances: Install entrance and storefront systems to comply with the following maximum tolerances:

1. Variation from Plane: Limit variation from plane or location shown to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment: Where surfaces abut in line, limit offset from true alignment to 1/16 inch. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 ADJUSTING AND CLEANING

A. Remove excess sealant and glazing compounds, and dirt from surfaces.

B. Adjust doors and hardware to provide tight fit at contact points and weatherstripping, smooth operation and weathertight closure.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure entrance and storefront systems are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 41 00

SECTION 08 71 00 - 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.
2. Sliding doors.
3. Other doors to the extent indicated.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Cylinders specified for doors in other sections.

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 System.”

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. ANSI/UL 294 - Access Control System Units.

4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

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. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.
c. 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. 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.

F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

G. 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.

H. 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

I. 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 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. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Five years for exit hardware.
3. Twenty five years for manual overhead door closer bodies.
4. Five years for motorized electric latch retraction exit devices.
5. Two years for electromechanical door hardware, unless noted otherwise.

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.

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 certified 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 or equal: Subject to compliance with requirements.

a. Hager Companies (HA).
b. McKinney (MK).
c. Stanley Hardware (ST).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified 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 or equal: Subject to compliance with requirements.

a. Hager Companies (HA).
b. Pemko (PE).
c. Select Hinges (SL).
d. Stanley Hardware (ST).

C. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.

1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.

2. Cascading: Provide a bi-parting or single direction telescoping system as required with a minimum 200 lb. per door capacity.

3. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.

4. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.

5. Manufacturers or equal: Subject to compliance with requirements.

a. Hager Companies (HA).
b. Johnson Hardware (JO).
c. Pemko (PE).

2.3 POWER TRANSFER DEVICES

A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges 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 with a 1-year warranty. 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 or equal: Subject to compliance with requirements.

a. Hager Companies (HA) - ETW-QC (# wires) Option.
b. McKinney (MK) - QC (# wires) Option.
c. Stanley Hardware (ST) - C Option.

B. Electrified Quick Connect Continuous Geared Transfer Hinges: Provide electrified transfer continuous geared hinges with a removable service panel cutout accessible without de-mounting door from the frame. Furnish with Molex™ standardized plug connectors with 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 or equal: Subject to compliance with requirements.

a. Pemko (PE) - SER-QC (# wires) Option.

C. 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. Manufacturers or equal: Subject to compliance with requirements. Provide 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 or equal: Subject to compliance with requirements.

a. Hager Companies (HA) - Quick Connect.
b. McKinney (MK) - QC-C Series.
c. Stanley Hardware (ST) - WH Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

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 or equal: Subject to compliance with requirements.

a. Door Controls International (DC).

b. Rockwood (RO).
c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls 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. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

5. Manufacturers or equal: Subject to compliance with requirements.

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.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. 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.

D. Interchangeable Cores: Provide small format interchangeable cores as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

E. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

F. 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.

G. 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).

H. Construction Keying: Provide construction master keyed cylinders.

I. 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 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Lund Equipment (LU).
b. MMF Industries (MM).
c. Telkee (TK).

P. Electronic Key Management System: Provide an electronic key control system with Stand-alone Plug and Play features including advanced RFID technology. Touchscreen interface with PIN access for keys individually locked in place. Minimum 1,000 system users and 21 iFobs for locking receptors. System shall have a minimum 250,000 audit events screen displayed or ability to be exported via USB port.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Medeco (MC).
b. Traka (TA).

2.7 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 or equal: Subject to compliance with requirements.

    a. Corbin Russwin Hardware (RU) - ML2000 Series.
    b. dormakaba Best (BE) - 45H Series.
    c. Sargent Manufacturing (SA) - 8200 Series.

2.8 ELECTROMECHANICAL LOCKING DEVICES

A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): 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 and in the hardware sets.

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. Manufacturers or equal: Subject to compliance with requirements.

    a. Corbin Russwin Hardware (RU) - ML20900 Series.
    b. Sargent Manufacturing (SA) - 8200 Series.
    c. Yale Commercial(YA) - 8800FL Series.

2.9 AUXILIARY LOCKS

A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers or equal: Subject to compliance with requirements.

    a. dormakaba Best (BE) - 48H Series.
    b. Corbin Russwin Hardware (RU) - DL4000 Series.
    c. Sargent Manufacturing (SA) - 4870 Series.

B. Mortise Deadlocks, Large Case: ANSI/BHMA A156.13 Grade 1 Certified Products Directory (CPD) listed large case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. One piece stainless steel bolts with a 1" throw. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers or equal: Subject to compliance with requirements.

    a. Corbin Russwin Hardware (RU) - ML2000 Series.

b. dormakaba Best (BE) - 47H Series.
c. Sargent Manufacturing (SA) - 8200 Series.
d. Yale Commercial(YA) - 8800 Series.

2.10 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.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.

8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.

9. Rail Sizing: Provide exit device rails factory sized for proper door width application.

10. 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 or equal: Subject to compliance with requirements.

a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. dormakaba Precision (PR) - Apex 2000 Series.

2.12 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 or equal: Subject to compliance with requirements.

a. Corbin Russwin Hardware (RU) - ED5000 Series.
b. Sargent Manufacturing (SA) - 80 Series.
c. Yale (YA) - 7000 Series.

2.13 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 (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty 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 and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers or equal: Subject to compliance with requirements.

   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. dormakaba (DO) - 8900 Series.
   c. Sargent Manufacturing (SA) - 1431 Series

2.14 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 certified 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 or equal: Subject to compliance with requirements.

   a. Hiawatha, Inc. (HI).
   b. Rockwood (RO).
   c. Trimco (TC).

2.15 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 certified 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 or equal: Subject to compliance with requirements.

      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 or equal: Subject to compliance with requirements.

      a. dormakaba (DO).
      b. Rockwood (RO).
      c. Sargent Manufacturing (SA).

2.16 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 or equal: Subject to compliance with requirements.

1. National Guard Products (NG).
2. Pemko (PE).
3. Reese Enterprises, Inc. (RE).
4. Zero (ZE).

2.17 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Securitron (SU) - DPS Series.

B. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

2. Manufacturers or equal: Subject to compliance with requirements.

    a. Securitron (SU) - AQD Series.

C. 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. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.

2. Manufacturers or equal: Subject to compliance with requirements.

    a. Securitron (SU) - AQL Series.

2.18 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.

2.19 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.

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 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.

3.5 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.

3.6 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.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 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.

Hardware Sets

Set: 1.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 100a, 100b, 103
Description: EXT - PR - AL - PANIC - EAC - 72

1	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Removable Mullion	907BKM		RU
1	Rim Exit Device, Exit Only	ED5200S EO M107 M92 MELR	630	RU
1	Rim Exit Device, Nightlatch	ED5200S K157ET M107 M92 MELR CLS7	630	RU
2	Cylinder	Coremax		BE
2	Door Pull	RM3310-72 MP	US32D	RO
2	Concealed Closer	91NDCP	626	RF
2	Surface Closer	DC8230/40 as req X Drop Plate	689	RU
1	Card Reader	By Security Vendor		OT
2	Door Stop	467	Black	RO
1	Threshold	2005AV MSES25SS		PE
1	Gasketing	by door / frame mfg		
2	Sweep	315CN		PE
2	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
2	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
2	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through the security software.
The door will remain locked in a power loss.
Free egress at all times

Hardware is basis of design. Provide hardware that meets local windstorm codes

Set: 2.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 135c
Description: EXT - PR - AL - PANIC - EAC - 12

1	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Removable Mullion	907BKM		RU
1	Rim Exit Device, Exit Only	ED5200S EO M107 M92 MELR	630	RU
1	Rim Exit Device, Nightlatch	ED5200S K157ET M107 M92 MELR CLS7	630	RU
2	Cylinder	Coremax		BE
2	Door Pull	RM3310-12	US32D	RO
2	Concealed Closer	91NDCP	626	RF
2	Surface Closer	DC8230/40 as req X Drop Plate	689	RU
1	Card Reader	By Security Vendor		OT
2	Door Stop	467	Black	RO
1	Threshold	2005AV MSES25SS		PE

1	Gasketing	by door / frame mfg	
2	Sweep	315CN	PE
2	ElectroLynx Harness	QC-C1500P [PS to Hinge]	MK
1	Wiring Diagram	WD-SYSPK	SA
2	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]	MK
2	Position Switch	DPS-M/W-WH (as required)	SU
1	Power Supply	AQLX-E1 - Size as required	SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through the security software.
The door will remain locked in a power loss.
Free egress at all times

Hardware is basis of design. Provide hardware that meets local windstorm codes

Set: 3.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 107b, 129b
Description: EXT - AL - PANIC - EAC - 12

1	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Rim Exit Device, Nightlatch	ED5200S K157ET M107 M92 MELR CLS7	630	RU
1	Cylinder	Coremax		BE
1	Door Pull	RM3310-12	US32D	RO
1	Concealed Closer	91NDCP	626	RF
1	Surface Closer	DC8230/40 as req X Drop Plate	689	RU
1	Door Stop	467	Black	RO
1	Threshold	2005AV MSES25SS		PE
1	Sweep	315CN		PE
1	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
1	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through the security software.
The door will remain locked in a power loss.
Free egress at all times

Hardware is basis of design. Provide hardware that meets local windstorm codes

Set: 4.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 135a, 135b
Description: EXT - PR - PANIC - EAC - 12

2	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Removable Mullion	907BKM		RU
1	Rim Exit Device, Exit Only	ED5200S EO M107 M92 MELR	630	RU
1	Rim Exit Device, Nightlatch	ED5200S K157ET M107 M92 MELR CLS7	630	RU
2	Cylinder	Coremax		BE

2	Door Pull	RM3310-12	US32D	RO
2	Concealed Closer	91NDCP	626	RF
2	Card Reader	By Security Vendor		OT
2	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
2	Door Stop	467	Black	RO
1	Threshold	2005AV MSES25SS		PE
1	Gasketing	303AS TKSP		PE
2	Sweep	315CN		PE
1	Astragal [set]	S772D [mtg on mull]		PE
2	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
2	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
2	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through the security software.
The door will remain locked in a power loss.
Free egress at all times

Hardware is basis of design. Provide hardware that meets local windstorm codes

Set: 5.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 136a
Description: PR - STOR

2	Continuous Hinge	CFMXXHD1		PE
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Security Storeroom Lock	ML2059 103W CLS7	626	RU
1	Cylinder	Coremax		BE
2	Door Stop	409 / 446 [as required]	US32D	RO
1	Threshold	2005AV MSES25SS		PE
1	Gasketing	303AS TKSP		PE
1	Astragal	305CN TKSP		PE
1	Position Switch	DPS-M/W-WH (as required)		SU

Notes: Hardware is basis of design. Provide hardware that meets local windstorm codes

Set: 6.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 101
Description: PR - AL - PP

2	Continuous Hinge	CFMXXHD1		PE
2	Door Pull	RM3310-72 MP	US32D	RO
2	Concealed Closer	91NDCP	626	RF
1	Gasketing	by door / frame mfg		

Set: 7.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 105a
Description: PR - PANIC - EAC - AL FRAME

2	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Removable Mullion	907BKM		RU
1	Rim Exit Device, Exit Only	ED5200S EO M92	630	RU
1	Rim Exit Device, Nightlatch	ED5200S K157ET M92 MELR CLS7	630	RU
2	Cylinder	Coremax		BE
1	Door Pull	RM3310-12	US32D	RO
2	Surface Closer	DC6210 A4	689	RU
1	Card Reader	By Security Vendor		OT
2	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
2	Silencer	608		RO
2	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
2	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
2	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through the security software.
The door will remain locked in a power loss.
Free egress at all times

Set: 8.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 123
Description: PR - AL - PANIC - EAC

2	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Removable Mullion	907BKM		RU
1	Rim Exit Device, Exit Only	ED5200S EO M107 M92 MELR	630	RU
1	Rim Exit Device, Nightlatch	ED5200S K157ET M92 MELR CLS7	630	RU
2	SFIC Cylinder Core	Match Existing	626	RU
1	Door Pull	RM3310-12	US32D	RO
2	Concealed Closer	91NDCP	626	RF
1	Card Reader	By Security Vendor		OT
2	Door Stop	409 / 446 [as required]	US32D	RO
1	Gasketing	by door / frame mfg		
2	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
2	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
2	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through teh security software.
The door will remain locked in a power loss.
Free egress at all times

Set: 9.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 108, 113, 131
Description: PR - STOR - OH HO

6	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	ML2057 103W CLS7	626	RU
1	Cylinder	Coremax		BE
2	Surf Overhead Hold Open	10-326	630	RF
2	Silencer	608		RO

Set: 10.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 114
Description: PR - STOR - OH HO - AL FRAME

2	Continuous Hinge	CFMXXHD1		PE
2	Flush Bolt	555	US26D	RO
1	Dust Proof Strike	570	US26D	RO
1	Storeroom Lock	ML2057 103W CLS7	626	RU
1	Cylinder	Coremax		BE
2	Surf Overhead Hold Open	10-326	630	RF
2	Silencer	608		RO

Set: 11.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 105c
Description: PANIC - EAC - AL FRAME

1	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Rim Exit Device, Storeroom	ED5200S 103959ET M92 MELR CLS7	630	RU
1	Cylinder	Coremax		BE
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Card Reader	By Security Vendor		OT
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
1	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
1	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through teh security software.
The door will remain locked in a power loss.
Free egress at all times

Set: 12.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 106, 121b
Description: STOR

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	ML2057 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 13.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 128
Description: STOR - HW

3	Hinge, Full Mortise, Hvy Wt	T4A3786 QCXX 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	ML2057 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 14.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 112, 125
Description: STOR - OHS

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	ML2057 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Surf Overhead Stop	10-336	630	RF
3	Silencer	608		RO

Set: 15.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 102, 118, 119, 120
Description: OFFICE - AL FRAME

1	Continuous Hinge	CFMXXHD1		PE
1	Storeroom Lock	ML2057 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO
1	Coat Hook	RM811	US26D	RO

Set: 16.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 132
Description: CLASS - CLOSER - AL FRAME

1	Continuous Hinge	CFMXXHD1		PE
1	Classroom Lock	ML2055 103W CLS7	626	RU

1	Cylinder	Coremax		BE
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 17.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 124, 127
Description: EAC

2	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Hinge [Elec]	TA2714 QCXX 4-1/2" x 4-1/2"	US26D	MK
1	Fail Secure Lock	ML20906-SEC 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Card Reader	By Security Vendor		OT
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO
1	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
1	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through teh security software.
The door will remain locked in a power loss.
Free egress at all times

Set: 18.0

Manufacturers or equal: Subject to compliance with requirements.
Doors: 105b, 109a, 109b, 116a, 116b
Description: EAC - AL FRAME

1	Continuous Hinge	CFM83HD1 EL-EPT		PE
1	Fail Secure Lock	ML20906-SEC 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Card Reader	By Security Vendor		OT
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO
1	ElectroLynx Harness	QC-C1500P [PS to Hinge]		MK
1	Wiring Diagram	WD-SYSPK		SA
1	ElectroLynx Harness	QC-C3XXP [Hinge to lock/exit/reader]		MK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secure. Access by valid credential or key override.
Door can be set to a timezone through teh security software.

The door will remain locked in a power loss.
Free egress at all times

Set: 19.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 126
Description: CLASS

3	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1	Classroom Lock	ML2055 103W CLS7	626	RU
1	Cylinder	Coremax		BE
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 20.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 115, 121a, 122, 130
Description: CLASS - AL FRAME

1	Continuous Hinge	CFMXXHD1		PE
1	Mortise Deadlock AD	MS1850S Schoolhouse Function x 4066 [ADA-7181]		628
1	Cylinder	Coremax		BE
2	Door Pull	RM3310-12	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
1	Gasketing	by door / frame mfg		

Set: 21.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 133b, 134b
Description: PP- DB

3	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1	Deadbolt	DL4113 CL7	626	RU
1	Cylinder	Coremax		BE
1	Pull Plate	BF 110 x 70C	US32D	RO
1	Push Plate	70C	US32D	RO
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Mop Plate	K1050 4" X 1" LDW 4BE CSK	US32D	RO
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 22.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 129a
Description: PP- DB - AL FRAME

1	Continuous Hinge	CFMXXHD1		PE
1	Deadbolt	DL4113 CL7	626	RU
1	Cylinder	Coremax		BE
1	Push Plate	70C	US32D	RO

1	Door Pull	RM3310-12	US32D	RO
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Mop Plate	K1050 4" X 1" LDW 4BE CSK	US32D	RO
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 23.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 110, 111, 133a, 134a
Description: PP

3	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK
1	Pull Plate	BF 110 x 70C	US32D	RO
1	Push Plate	70C	US32D	RO
1	Surface Closer	DC6210 A3 /A10 As Required	689	RU
1	Mop Plate	K1050 4" X 1" LDW 4BE CSK	US32D	RO
1	Kick Plate	K1050 12" X 1.5" LDW 4BE CSK	US32D	RO
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 24.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 104
Description: PASS - AL FRAME

1	Continuous Hinge	CFMXXHD1		PE
1	Passage Latch	ML2010 103W	626	RU
1	Door Stop	409 / 446 [as required]	US32D	RO
3	Silencer	608		RO

Set: 25.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 117
Description: BI FOLD - LK

1	Bi-fold Door set	HF4/100A/XX		PE
1	Mortise Deadlock [Sliding]	2331 x 4066 [ADA-7181]	626	AD
2	Cylinder	Coremax		BE

Set: 26.0
Manufacturers or equal: Subject to compliance with requirements.
Doors: 150, 151, 152
Description: OH

1	Cylinder	Coremax		BE
1	Hardware	By door mfg		

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

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 glazing for the following products and applications:
   1. Storefront aluminum framed doors.
   2. Interior wood doors where scheduled.
   3. Glazed aluminum framed exterior walls (storefront).
   4. Interior borrowed lites where shown.

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of any insulating glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking and other indications of deterioration in metallic coating.

D. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for 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.

E. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination material obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standards.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movements, wind and impact loads without failure, including loss or glass breakage attributable to the following:

defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Minimum glass thicknesses of lites composed of annealed or heat-treated glass are selected so the worst-case probability of failure does not exceed the following:
   a. Specified Design Wind Loads: As indicated on the structural drawings.
   b. Specified Design Snow Loads: As indicated on the structural drawings, but not less than snow loads applicable to Project, required by ASCE 7, "Minimum Design Loads for Buildings and Other Structures", Section 7, "Snow Loads".
   c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
   d. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.
   e. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. Center-of-Glass U-Values: NFRC 100 methodology using LBL-35298 WINDOW 5.2 computer program, expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
2. Center-of-Glass Solar Heat Gain Coefficient: NFRC 200 methodology using LBL-35298 WINDOW 5.2 computer program.
3. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: 12-inch- (300-mm-) square, for each type of glass product indicated, other than monolithic clear float glass, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view.

C. Glazing contractor to obtain compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants and other glazing materials.

D. Glazing Schedule: Use same designations indicated on Drawings.

1.6 QUALITY ASSURANCE

A. Safety Glass: Category II materials safety glass products are to comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201.

1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

B. Glazing Publications: Comply with recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or in referenced standards.

1. GANA Publications: "Glazing Manual."
2. SIGMA Publications: SIGMA TM-3000, "Vertical Glazing Guidelines."
3. Tempering Division – Engineering Standards Manual.
4. Laminating Division – Laminated Glass Design Guide.
5. LSGA Publications.

C. Insulating-Glass Certification Program: Insulating glass products are to be permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:

I. Insulating Glass Certification Council (IGCC).

D. Single Source fabrication responsibility: All fabrication processes, including Low E and reflective coatings, insulating laminating, silkscreen, and tempering, shall be fabricated by a single Fabricator.

E. Glass fabricator to have 10 years of experience and meet ANSI / ASQC Q9002 1994.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by the glazing manufacturers and when glazing channel substrates are wet from rain, frost condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form, made out to Owner and signed by manufacturer, in which manufacturer agrees to furnish replacements for units that deteriorate from normal use by developing defects attributable to the manufacturing process, f.o.b. the nearest shipping point to Project site, within warranty period.

1. Provide a written 5-year warranty from date of manufacture for laminated glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer's published instructions.

2. Provide a written 10-year warranty (vertical application) from date of manufacture for insulating glass. Warranty covers deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to full compliance with all requirements, products that may be incorporated into the Work include the products indicated in the glass schedule at the end of part 3 (basis of design is Guardian Industries, Corp.). Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

Manufacturers or equal: Subject to compliance with requirements.
a. Vitro Glass
b. Guardian Industries Corp.
c. Oldcastle Architectural Glass

B. Other manufacturers with similar products meeting all requirements may be acceptable upon complete data submittal and Architect approval prior to Bidding in accordance with Division 1.

2.2 GLASS MATERIALS

A. Flat Glass: ASTM C 1036, Type I Class 1 (clear) and Quality q3.

B. Heat-Treated Flat Glass: ASTM C 1048; Type I (transparent glass, flat); Quality q3.
1. Kind heat-strengthened (HS).
2. Kind fully tempered (FT)>
3. Heat treated flat glass to be by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.

C. Laminated Glass:
1. ASTM C1172 – Laminated Architectural Flat Glass.
2. Laminated Process: Autoclave with heat plus pressure.
3. Interlayer Material: Polyvinyl butyral sheets.

D. Insulating-Glass:

1. ASTM E773 Seal Durability of Sealed Insulating Glass Units.
2. ASTM E774 Sealed Insulating Glass Units.
3. Sealed insulating glass units to be doubled sealed with a primary seal of black (or gray) polyisobutylene and a secondary seal of black (or gray) silicone.

4. Lites shall be separated by an aluminum spacer with 3 bent corners and 1 keyed-soldered corner, or 4 bent corners and a straight butyl injected zinc plated steel straight key joint, to provide hermetically sealed and dehydrated air space.
5. Units shall be certified for compliance with seal classification "CBA" by the Insulating Glass Certification Council (IGCC) and tested in accordance with the above ASTM Test Methods.

2.3 MISCELLANEOUS GLAZING MATERIALS

A. Select glazing sealants, tapes, gaskets and other glazing materials of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.

PART 3 - EXECUTION

3.1 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.

1. Verify prepared openings for glazing are correctly sized and within tolerances, that a functioning weep system is present, that the minimum required face and edge clearances are being followed, and do not proceed with glazing until unsatisfactory conditions have been corrected.

2. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3. Install products using the recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials except where more stringent requirements are indicated, including those in "GANA Glazing Manual".

4. Protect exterior glass from edge damage during the handling and installation.

5. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter.

6. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

7. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

3.2 GLASS SCHEDULE – See Drawings

END OF SECTION 08 80 00

SECTION 09 26 00 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum wallboard.
2. Exterior gypsum panels (sheathing)
3. Tile backing panels.
4. Texture Finishes.
5. Non-load-bearing steel framing.

1.2 SUBMITTALS

A. Product Data: For each product indicated.

B. Samples: For each textured finish indicated and on same backing indicated for Work.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

C. Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and qualities of materials and execution.

1. Install mockups for the following applications:

a. Surfaces with texture finishes.

2. Simulate finished lighting conditions for review of mockups.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

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. Products or equal: Subject to compliance with requirements.

2.2 STEEL FRAMING

A. Steel Framing, General: Comply with ASTM C *754* for conditions indicated.

1. Steel Sheet Components: Metal complying with ASTM C 645 requirements.

a. Protective Coating:

1) Interior Applications: Manufacturer's standard corrosion-resistant zinc coating.

B. Partition Framing:

1. Steel Studs and Runners: ASTM C 645, in depth indicated.

a. Minimum Base Metal Thickness: 0.027 inch (0.7 mm)

b. Studs to be 20 gauge at interior locations for both 6" and 3⅝" metal studs at 16" o.c.

2. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.

a. Products or equal: Subject to compliance with requirements.

1) Delta Star, Inc., Superior Metal Trim; Superior Flex Track System (SFT).
2) Metal-Lite, Inc.; Slotted Track.

3. Proprietary Firestop Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products or equal: Subject to compliance with requirements.

1) Fire Trak Corp.; Fire Trak
2) Metal-Lite, Inc.; The System.

4. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

    a. Minimum Base Metal Thickness: 0.027 inch (0.7 mm).

5. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, and in depth indicated.

    a. Clip Angle: 1-1/2 by 1-1/2 inch (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

6. Hat-Shaped, Rigid Furring Channels: ASTM C 645, in depth indicated.

    a. Minimum Base Metal Thickness: 0.0179 inch (0.45 mm).

7. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flange, and in depth indicated.

    a. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare steel thickness of 0.0312 inch (0.79 mm).
    b. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

8. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

9. Resilient Furring Channels: ½ inch – (13 mm-) deep, steel sheet members designed to reduce sound transmission. RC Deluxe by ClarkDeitrich – no substitutions allowed.

    a. Configuration: Asymmetrical.

10. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.3 PANEL PRODUCTS

A. Panel Size, General: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

    1. Type X: In thickness indicated and with long edges tapered.

C. Flexible Gypsum Wallboard: ASTM C 36, manufactured to bend to fit tight radii and to be more flexible than standard regular-type panels of the same thickness, 1/4 inch (6.4 mm) thick, and with long edges tapered. Apply in double layer at curved assemblies.

D. Sag-Resistant Gypsum Wallboard: ASTM C 36, manufactured to have more sag resistance than regular-type gypsum board, 5/8 inch (12.7 mm) thick, and with long edges tapered. Apply on ceiling surfaces.

E. Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M, with core type and in thickness indicated.

2. Cementitious Backer Units: ANSI A118.9, in thickness indicated.

F. Exterior Gypsum Board for Sheathing

1. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

2. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 117M.

a. Available Product: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, "Dens-Glass Gold" by G-P Gypsum Corp.
b. Core: 5/8 inch (15.9 mm).

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Corner Bead: Use at outside corners
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated
4. Expansion (Control) Joint: Use where indicated

B. Exterior Trim: ASTM C 1047, hot-dip galvanized steel sheet or rolled zinc.

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening. Use where indicated

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, flanges of trim accessories, and fasteners, use setting-type taping compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use drying-type, all-purpose 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.

D. Joint Compound for Exterior Applications:

1. Glass-Mat Gypsum Sheathing Board: As recommended by manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping and setting-type, sandable topping compounds.
2. Cementitious Backer Units: As recommended by manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. 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 (0.84 to 2.84 mm) thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. 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.

PART 3 - EXECUTION

3.1 NON-LOAD-BEARING STEEL FRAMING INSTALLATION

A. General: Comply with ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Partition Framing:

1. Where studs are installed directly against exterior walls, install isolation strip between studs and wall.
2. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
3. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. 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. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

4. 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.

C. Z-Furring Members: Erect insulation vertically and hold in place with Z-furring members.

1. Until gypsum board is installed, hold insulation in place with 10-inch (250-mm) staples fabricated from 0.0625-inch- (1.59-mm-) diameter, tie wire and inserted through slot in web of member.

3.2 PANEL PRODUCT INSTALLATION

A. Gypsum Board: Comply with ASTM C 840 and GA-216.
1. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.
2. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
3. 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 board.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

4. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
5. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
6. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
7. Do not install panels in direct contact with masonry or concrete. Provide sealant (or furring if necessary) to maintain min ¼"gap.

B. Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.
2. Cementitious Backer Unit Application: ANSI A108.11.

3.3 FINISHING

A. Installing Trim Accessories: 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. Finishing Gypsum Board Panels: 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.

1. Prefill open joints, rounded or beveled edges,] and damaged surface areas.
2. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

C. Cementitious Backer Units: Finish according to manufacturer's written instructions.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated**,** unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges at utility areas and surfaces behind fixed cabinetry
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
4. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface at walls and ceilings scheduled to receive semi-gloss paint.

3.4 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 26 00

SECTION 09 30 00 - TILE

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. Floor Porcelain Tile.
2. Wall Glazed Tile.
3. Stone thresholds installed as part of tile installations.
4. Coated glass mat water resistant gypsum backer board for wall tile.

B. Related Sections include the following:

1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Shop Drawings: For the following:

1. Tile patterns and locations.

C. Tile Samples for Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.

D. Grout Samples for Selection: Manufacturer's color charts consisting of actual sections of grout showing the full range of colors available for each type of grout indicated.

E. Samples of stone thresholds in 6-inch lengths.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each

contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide the following or equal:

1. Tile Products:

a. As indicated on the drawings

2. Tile-Setting and -Grouting Materials:

a. Custom Building Products.
b. Laticrete International, Inc.
c. Mapei Corporation

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. Match Architect's samples.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.

2.3 TILE PRODUCTS

A. Floor Glazed Tile:

1. As indicated on the drawings.
2. Colors and sizes as indicated on the drawings.

B. Wall Glazed Tile:

1. As indicated on the drawings.
2. Colors and sizes as indicated on the drawings.

D. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
2. Base: 6 by 13 inches, bullnose.

E. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as adjoining wall tile.

1. One corner quarter round soap holder and one shampoo shelf.
2. Color and Finish: Match adjoining glazed wall tile.

2.4 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to ½ inch (12.7 mm) or less, and finish bevel to match face of threshold.

2.5 SETTING MATERIALS (THIN-SET APPLICATIONS)

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:

1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

a. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

B. Water-Cleanable, Tile-Setting Epoxy Adhesive: ANSI A118.3.

2.6 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:

1. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:

a. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 for materials described in Section H-2.3, for joints 1/8 inch and narrower.
b. Latex Additive: Acrylic resin.
c. Color as selected by Architect from manufacturer’s standard colors.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.8 CEMENTITIOUS BACKER UNITS

A. Provide coated glass mat water resistant gypsum backer board units complying with ANSI A118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.

1. Thickness: Manufacturer's standard thickness, but not less than 5/8 inch, unless otherwise indicated.
2. Width: Manufacturer's standard width, but not less than 32 inches.

B. Products or equal: Subject to compliance with requirements:

1. DensShield Tile Backer
2. Glasroc Tile Backer
3. USG Durock

2.9 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Crack Suppression and Waterproofing Membrane: Use method F148 with uncoupling membrane. Basis-of-Design Product or equal: Schluter DITRA Uncoupling membrane.

C. Tile Cleaner: A neutral, non-abrasive cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.

3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.

1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

H. Grout tile to comply with the requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Porcelain Tile: 3/16 inch.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.5 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:

1. Porecelain Wall Tile: 1/16 inch.

3.6 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.7 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over crack isolation membrane until membrane has cured.

3.8 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09 30 00

SECTION 09 51 10 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes ceilings composed of acoustical panels and exposed suspension systems.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. 6-inch- square samples of each acoustical panel type, pattern, and color.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings is complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system components with

other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition assemblies (if any).

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following (or approved equal):

1. Armstrong Industries
2. CertainTeed
3. USG Ceilings

B. See schedule on drawings for ceiling system types and drawings for locations.

2.2 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch- diameter wire.

D. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

E. See schedule on drawings for suspension system types and drawings for locations.

2.3 NON-FIRE-RESISTANCE-RATED, DIRECT-HUNG SUSPENSION SYSTEMS

A. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed

from prepainted or electrolytic zinc-coated, cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:

1. Structural Classification: Intermediate-duty system.
2. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.
3. Cap Material and Finish: Steel sheet painted to match color of acoustical unit.

2.4 ACOUSTICAL SEALANT

A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:

1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies per ASTM E 90.
2. Product has flame-spread and smoke-developed ratings of less than 25 per ASTM E 84.

B. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.

1. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

B. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Splay hangers only where required, and if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   7. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

   1. Screw attach moldings to substrate at intervals not over 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

   1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

   2. Paint the cut panel edges remaining exposed after installation; match color of exposed panel surfaces using coating recommended for this purpose by acoustical panel manufacturer.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 10

SECTION 096460 – RESILIENT ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Vinyl sheet flooring (Gymnasium).
   2. Recycled tire rubber flooring (Fitness Room).

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.

D. Product Schedule: For resilient products. Use same designations indicated on Drawings**.**

1.4 QUALITY ASSURANCE

A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. An installer is “qualified” if trained, or certified by flooring manufacturer or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.

B. Mockups: Provide resilient products with mockups specified in other Sections.

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 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.6 PROJECT CONDITIONS

A. Install resilient products after other finishing operations, including painting, have been completed.

B. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

C. Maintain the ambient relative humidity between 40% and 60% during installation.

D. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 2 - PRODUCTS

2.1 TRAINING HETEROGENOUS VINYL SHEET SPORTS SFLOORING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Tarkett; **Training** or equal.

B. Sheet Standard: ASTM F 1303, [Type 1, Grade 1, Class C foamed backing].

C. Thickness/Wearlayer: 0.197 inch (5 mm).

D. Size: As indicated on drawings.

E. Colors and Patterns: As indicated on drawings..

F. Test data:
   1. Chemical Resistance (ASTM F925): Passes
   2. Static Load Limit (ASTM F970): Passes 175 psi
   3. Static Coefficient of Friction (ASTM D 2047): ≥ 0.5 SCOF
   4. Flamability (ASTM E648, Critical Radiant Flux): Class 1 (≥ 0.45 W/cm^2)
   5. Limited Commercial Warranty: 10 years

2.2 RECYCLED TIRE RUBBER SPORTS SFLOORING

A. Basis-of-Design Product: Subject to compliance with requirements. Robbins; **Galaxy Classic surface** or equal.

B. Surface shall be rubber roll goods 3/8 inch thick, 4 feet wide, and 40 feet long. Material shall be comprised of rubber granules from recycled automobile tires, and colors indicated on drawings, colored EPDM rubber granules, encapsulated in a zero-mercury polyurethane binder.

C. Typical physical properties of **Galaxy Classic**

• Density PCF ASTM D3676	60
• Shore A Hardness D2240	60 +/-5
• Compression & Recovery (%)	C 5-15
F36 (100 PSI 5-15)	R85

- Static Load Limit (PSI) 970-93 >4,000
- Flexibility F137 ¼' Mandrel PASS
- Co-efficient of Friction D2047-82 (Wet and Dry Avg) 1.20
- Tear Strength ASTM D624 80 pli min
- Elongation ASTM D412 >145%
- Tensile Strength >220 PSI
- Compression Set B D395 (25% Defl., 158*F/22Hrs) 60
- Compression Endurance D623 (10,000 Cycles With 4-10 Ton Load) NO DETERIORATION
- Abrasion Resistance C501 (Weight loss in GMS/KC) H18 Wheel, 500 GM Load 0.18
- Freeze Thaw (-40*C, 40* Cycles) NO CHANGE
- Thermal Stability -40*C to +90*C
- Accelerated Weathering (2500) NO CHANGE
- NY Fire Gas Toxicity #09300 900 216 4006 YES

2.3 INSTALLATION MATERIALS

A. Adhesives: As recommended by flooring manufacturer to meet site conditions.

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.

B. 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.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure proper adhesion of Resilient Flooring.
   1. Prepare concrete substrates in accordance with ASTM F 710.
      a. Concrete treads must be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitence, mold, mildew, and other foreign materials that

may affect dissipation rate of moisture from the concrete, discoloration or adhesive bonding.

b. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.

B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.
1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of 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 surfaces thoroughly.
3. Damp-mop 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.
1. No traffic for 24 hours after installation.
2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.

D. Wait 72 hours after installation before performing initial cleaning.

E. A regular maintenance program must be started after the initial cleaning.

END OF SECTION 09 64 60

SECTION 09 65 10 - RESILIENT FLOOR TILE

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. Luxury Vinyl tile (LVT)

B. Resilient wall base, reducer strips, and other accessories installed with resilient floor tiles are specified in Division 9 Section "Resilient Wall Base and Accessories."

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Samples for selection purposes in form of manufacturer's color charts consisting of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver tiles and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.

C. Store tiles on flat surfaces. Move tiles and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.5 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F in spaces to receive tiles for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.

B. Do not install tiles until they are at the same temperature as the space where they are to be installed.

C. Close spaces to traffic during tile installation.

1.6 SEQUENCING AND SCHEDULING

A. Install tiles and accessories after other finishing operations, including painting, have been completed.

B. Do not install tiles over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.7 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.

0. Furnish not less than one box for each 50 boxes or fraction thereof, of each class, wearing surface, color, pattern and size of resilient floor tile installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Provide the products as specified below:
B. Luxury Vinyl Tile - LVT:

0. Manufacturer: Interface, or approved equal.
1. Tile: Provide resilient tile flooring as scheduled in the following type and sizes:

a. Size: As indicated on drawings.

1) Color: See drawings for color selection.

2.2 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile manufacturer for applications indicated.

C. Adhesives (Cements): Water-resistant type recommended by tile manufacturer to suit resilient floor tile products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine areas where installation of tiles will occur, with Installer present, to verify that substrates and conditions are satisfactory for tile installation and comply with tile manufacturer's

requirements and those specified in this Section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
2. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.

C. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive tile.

B. Use trowelable leveling and patching compounds per tile manufacturer's directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered by tiles immediately before tile installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. General: Comply with tile manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.

B. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.

C. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles in basket weave pattern with grain direction alternating between reversed in adjacent tiles.

D. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture

including cabinets, pipes, outlets, edgings, thresholds, and nosings.

E. Extend tiles into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.

G. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

H. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.

I. Hand roll tiles where required by tile manufacturer.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing tile installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by tile manufacturers.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by resilient floor tile manufacturer.
4. Damp-mop tile to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.

1. Apply protective floor polish to tile surfaces that are free from soil, visible adhesive, and surface blemishes.

    a. Use commercially available, metal, cross-linked acrylic product acceptable to tile manufacturer.
    b. Coordinate selection of floor polish with Owner's maintenance service.

2. Cover tiles with undyed, untreated building paper until inspection for Substantial Completion.
3. Do not move heavy and sharp objects directly over tiles. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean tiles not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean tiles using method recommended by manufacturer.

1. Strip protective floor polish that was applied after completing installation prior to cleaning.

2. Reapply floor polish after cleaning.

END OF SECTION 09 65 10

SECTION 09 65 30 - RESILIENT WALL 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Resilient wall base.
2. Resilient flooring accessories.
3. Resilient carpet accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section "Resilient Tile Flooring."
2. Division 9 Section “Resilient sheet flooring.”
3. Division 9 Section “Tile Carpeting”

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

B. Samples for selection purposes of manufacturer's standard sample sets in form of pieces cut from each type of product specified showing full range of colors and patterns available.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility for Products: Obtain each type and color of product specified from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original manufacturer's unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F.

C. Move products into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

A. Maintain a minimum temperature of 70 deg F in spaces to receive products specified in this Section for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F.

B. Do not install products until they are at the same temperature as that of the space where they are to be installed.

C. Close spaces to traffic during installation of products specified in this Section.

1.7 SEQUENCING AND SCHEDULING

A. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Furnish not less than 10 linear feet for each 500 linear feet or fraction thereof of each different type and color of resilient wall base installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Base and resilient accessories:

a. Roppe Corporation
b. Flexco Company
c. Musson
d. Nora

2.2 RESILIENT WALL BASE

A. Rubber Wall Base: Products complying with FS SS-W-40, Type I.

2.4 RESILIENT ACCESSORIES

A. Rubber Accessories: Provide carpet edges for glue down applications, carpet nosing, resilient reducers cut back to fit VCT and other accessories required for edges of exposed finish floor material where there is an uneven transition between adjacent floor finishes or at flooring-to-concrete-slab transitions.

2.5 INSTALLATION ACCESSORIES

A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by flooring manufacturer for applications indicated.

C. Adhesives: Water-resistant type recommended by manufacturer to suit resilient flooring product and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where installation of products specified in this Section will occur, with Installer present, to verify that substrates and conditions are satisfactory for installation and comply with manufacturer's requirements and those specified in this Section.

3.2 PREPARATION

A. General: Comply with manufacturer's installation specifications for preparing substrates indicated to receive products indicated.

B. Use trowelable leveling and patching compounds per manufacturer’s directions to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

D. Broom or vacuum clean substrates to be covered immediately before installing products specified in this Section. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.

E. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

3.3 INSTALLATION

A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.

B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

1. Install inside and exterior corners before installing straight pieces.

C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.

D. Apply resilient products to stairs as indicated and according to manufacturer’s written instructions.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing installation:

1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers of resilient product involved.
2. Sweep or vacuum floor thoroughly.
3. Do not wash floor until after time period recommended by manufacturer.
4. Damp-mop resilient accessories to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

C. Clean products specified in this Section not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer.

END OF SECTION 09 65 30

SECTION 09 68 10 – TILE CARPETING

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 carpet tile and installation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 9 Section "Resilient Wall Base and Accessories" for materials and installation.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Samples for verification of the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected. Prepare Samples from the same material to be used for the Work. Label each sample with manufacturer's name, material type, color, pattern, and designation indicated on Drawings and carpet schedule. Submit the following:

1. Full tile Samples of each type of carpet material required.

C. Maintenance data for carpet and cushion to include in the operation and maintenance manual specified in Division 1. Include the following:

1. Methods for maintaining carpet, including manufacturer's recommended frequency for maintaining carpet.
2. Precautions for cleaning materials and methods that could be detrimental to finishes and performance. Include cleaning and stain-removal products and procedures.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who can demonstrate compliance with manufacturer's instructions and Carpet & Rug Institute (CRI) Carpet Installation Standard.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 5: "Storage and Handling."

B. Deliver materials to Project site in original factory wrappings and containers, labeled with identification of manufacturer, brand name, and lot number.

C. Store materials on-site in original undamaged packages, inside well-ventilated area protected from weather, moisture, soilage, extreme temperatures, and humidity. Lay flat, with continuous blocking off ground.

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6: "Site Conditions."

B. Space Enclosure and Environmental Limitations: Do not install carpet until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.

C. Subfloor Moisture Conditions: Moisture emission rate of not more than 3 lb/1000 sq. ft./24 hours when tested by calcium chloride moisture test in compliance with CRI 104, 6.2.1, with subfloor temperatures not less than 55 deg F.

D. Subfloor Alkalinity Conditions: A pH range of 5 to 9 when subfloor is wetted with potable water and Hydrion paper is applied.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Submit a written warranty executed by carpet manufacturer and Installer agreeing to repair or replace carpet that does not meet requirements or that fails in materials or workmanship within the specified warranty period. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

C. Warranty Period: Lifetime Fiber Performance Warrant for:
   Stain Removal
   Wear
   Colorfastness
   Static Protection
   Lifetime Warranty against Delamination and Tuftbind Failure (edge ravel, yarn pulls, zippering).

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Carpet: Before installation begins, furnish quantity of full cartons equal or greater than 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 CARPET TILE MANUFACTURER:

A. Carpet Tile - See drawings for location, colors and patterns.

2.2 INSTALLATION ACCESSORIES

A. Concrete-Slab Primer: Nonstaining type as recommended by the Carpet manufacturer.

B. Trowelable Underlayments and Patching Compounds: As recommended by the Carpet manufacturer.

C. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated and to comply with flammability requirements for installed carpet tile as recommended by the Carpet manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine subfloors and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting performance of carpet. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that subfloors and conditions are satisfactory for carpet installation and comply with requirements specified in this Section and those of the Carpet manufacturer.

3.2 PREPARATION

A. General: Comply with carpet manufacturer's installation recommendations to prepare substrates indicated to receive carpet installation.

B. Level subfloor within 1/4 inch in 10 feet, noncumulative, in all directions. Sand or grind protrusions, bumps, and ridges. Patch and repair cracks and rough areas. Fill depressions.

1. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the Carpet manufacturer.

C. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

D. Broom or vacuum clean subfloors to be covered with carpet tile. Following cleaning, examine subfloors for moisture, alkaline salts, carbonation, or dust.

E. Concrete-Subfloor Preparation: Apply concrete-slab primer, according to manufacturer's directions, where recommended by the Carpet manufacturer.

3.3 INSTALLATION

A. Direct Glue-Down Installation: Comply with CRI 104, Section 8: "Direct Glue-Down".

B. Comply with carpet manufacturer's recommendations for direction of carpet tile; maintain uniformity of carpet tile direction and lay of pile. Do not bridge building expansion joints with continuous carpet tile.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Install pattern parallel to walls and borders.

3.4 CLEANING

A. Perform the following operations immediately after completing installation.

1. Remove visible adhesive, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove protruding yarns from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

3.5 PROTECTION

A. General: Comply with CRI 104, Section 15: "Protection of Indoor Installation."

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure carpet is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09 68 10

SECTION 09 90 00 - PAINTING

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 surface preparation and field painting of the following:

1. Painting of all H.M. doors and frames.
2. Painting all exposed exterior metals (not anodized or prefinished).
3. Painting all exposed interior metals (not anodized, prefinished or unless noted otherwise).
4. Painting primed metal surfaces of equipment installed under mechanical and electrical work.
5. Painting of CMU walls.
6. Decorative Performance Coatings for interior walls requiring high durability.
7. Painting all exposed interior wall surfaces not scheduled to receive other finishes.
8. Painting of interior millwork where scheduled.

B. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork and casework.
b. Acoustical wall panels.
c. Finished mechanical and electrical equipment.
d. Light fixtures.
e. Distribution cabinets.

2. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
2. Division 8 Section "Flush Wood Doors" for transparent finishes applied to solid core wood doors.
3. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

1.3 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers.

1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

1. After color selection, the Architect will furnish color chips for surfaces to be coated.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding

air temperatures are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.

1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements.

1. Tnemec Company, Inc. (Tnemec)
2. Devoe & Raynolds Co. (Devoe).
3. Benjamin Moore & Co. (Moore)
4. Pratt & Lambert, Inc. (P & L)
5. Sherwin-Williams Co. (S-W)
6. Euclid Chemical Co. (Euclid)
7. RD Coatings USA (RD Coatings)
8. Tamms Industries, Inc. (Tamms)
9. Sto Corp. (Sto)

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide color selections made by the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and clean.

a. Scrape and clean small, dry seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

c. Back prime paneling on interior partitions where masonry, plaster, or other we wall construction occurs on backside.

3. Ferrous Metals: Clean un-galvanized, ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

a. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

b. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
9. Finish interior of wall and base cabinets and similar field-finished casework to match

exterior.

10. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

H. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Refer to Section 05120, Structural Steel. Primer is not required on shop-primed items.

1. Zinc Rich Primer / Epoxy / Polyurethane / Clear Coat

a. Primer: Organic Zinc Rich primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.

1) Tnemec: 90-97 Tneme-Zinc
2) or equal

b. Intermediate Coat: Polyamide Epoxy (color) applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.

1) Tnemec: 66 Epoxoline
2) or equal

c. Finish Coat: Aliphatic Polyurethane (color) applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.

1) Tnemec: 1075 Endura-Shield II (Semi-gloss Finish Unless otherwise Directed by the Architect.)

2) Or equal

B. Zinc-Coated Ferrous Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Epoxy / Polyurethane

a. Primer: Epoxy primer (color) applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.0 mils.

1) Tnemec: 66 Epoxoline
2) Or equal

b. Finish: Aliphatic Polyurethane (color) applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.

1) Tnemec: 1075 Endura-Shield II (Gloss Finish Unless otherwise Directed by the Architect.)
2) Or equal

C. Sheet Pile Retaining Wall: Provide polyester modified urethane paint finish:

1. Basis-of-Design: Sherwin-Williams Acrolon 218HS.

2. Or Equal.

D. Concrete Masonry Units (CMU) – Provide the following finish systems over concrete block:

1. Low-Luster Acrylic Enamel Finish: 2 finish coats of block filler.

a. Block filler: High performance, latex-based block filler applies at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 7.0 mils DFT or at a rate that will fill the pores of the CMU.

1) 52902 Bloxfil 200 Interior/Exterior Latex Block Filler or equal.
2) PPG 6-15 Speedhide Interior Exterior Latex Masonry Block Filler or equal.

b. First and Second Coats: Low luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.

1) Devoe or equal: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
2) Moore or equal: Moore's Regal Aqua Velvet #319.
3) P&L or equal: Z/F 4000 Series Accolade Interior Velvet.
4) PPG or equal: 6-2045XI Speedhide Exterior100% Acrylic Latex Satin Finish @ 1.4 mils DFT

E. Concrete Finishing Coating– Provide the following cement-based, dampproofing (color) over designated concrete walls:

1. Apply two coats at 55-70 sq.ft. (per 70 lb. kit) each coat.

a. Euclid Concrete Finisher
b. Tamms Concrete Finisher

3.7 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Ceilings - Flat Acrylic Finish: 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

1) Devoe or equal: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
2) Moore or equal: Regal First Coat Interior Latex Primer & Underbody #216.
3) P & L or equal: Z/F 1004 Suprime "4" Interior Latex Wall Primer.

b. First and Second Coats: Flat, acrylic-latex-based, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.

1) Devoe or equal: 36XX Wonder-Tones Interior Latex Flat Wall Paint.
2) Moore or equal: Regal Wall Satin #215.
3) P & L or equal: Z/F 2000 Series Vapex Latex Flat Wall Finish.

2. Typical Wall Finish - Flat, Acrylic Finish: 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

1) Devoe or equal: 50801 Wonder-Tones Interior Vinyl Latex Primer-Sealer.
2) Moore or equal: Regal First Coat Interior Latex Primer & Underbody #216.
3) P & L or equal: Z/F 1004 Suprime "4" Interior Latex Wall Primer.

b. First and Second Coats: Flat, acrylic-latex, interior paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils.

1) Devoe or equal: 36XX Wonder-Tones Interior Latex Flat Wall Paint.
2) Moore or equal: Regal Wall Stain #215.
3) P & L or equal: Z/F 2000 Series Vapex Latex Flat Wall Finish.

3. High Performance Decorative Wall Finish – Water-based polyurethane/acrylic textured paint finish system. Basis of Design: Scuffmaster by ICP Building Solutions Group

a. Primer:
1) Basis of Design or equal: “Primemaster Primer/Sealer,” ICP Building Solutions Group.

b. Textured Finish System Components:
1) Base Coat: Water-based polyurethane/acrylic base coat and cross-linker.

a. Basis of Design or equal: "Scuffmaster Vapor / Vapor Luxe Basecoat," ICP Building Solutions Group.

2) Pattern Coat: Water-based polyurethane/acrylic metallic pattern coat.

a. Basis of Design or equal: "Scuffmaster Vapor / Vapor Luxe Topcoat" ICP Building Solutions Group.

3) Miscellaneous Materials: Surface patching compounds and other materials necessary for application of finish system shall be of high quality and compatible with coating system.

B. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:

1. Semi-gloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.

a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

1) Devoe or equal: 51701 Wonder-Prime All-Purpose Latex Primer Sealer & Vapor Barrier.
2) Moore or equal: Moore's Alkyd Enamel Underbody #217.
3) P & L or equal: Z/F 1001 Suprime "1" 100 Percent Acrylic Multi-Purpose Primer.

C. Stained Woodwork: Provide the following stained finishes over new, interior woodwork:

1. Woodwork scheduled to be stained shall match Architect's sample**.** Materials and methods specified are options available and do not necessarily represent all the staining products required on the project.

2. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler before applying stain.

a. Filler Coat (On Open-Grained Wood): Paste-wood filler applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: None required.
2) Moore or equal: Benwood Paste Wood Filler #238.
3) P & L or equal: None required.
4) S-W or equal: Sher-Wood Fast-Dry Filler.

b. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 96XX WoodWorks Alkyd Interior Stain.
2) Moore or equal: Benwood Penetrating Stain #234.
3) P & L or equal: S-Series Tonetic Wood Stain.
4) S-W or equal: Oil Stain A-48 Series.

c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 4900 WoodWorks Quick-Dry Clear Sealer.
2) Moore or equal: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.
3) P & L or equal: H-40 Sanding Sealer.
4) S-W or equal: ProMar Varnish Sanding Sealer B26V3.

d. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 4600 WoodWorks Alkyd Satin Varnish.
2) Moore or equal: Benwood Satin Finish Varnish #404.
3) P & L or equal: H24 38 Clear Finish Gloss.
4) S-W or equal: Oil Base Varnish, Gloss A66V91.

3. Alkyd-Based Stain, Wax-Polished Finish: 3 finish coats of paste wax over a sealer coat and an alkyd-based, interior wood stain.

a. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 96XX WoodWorks Alkyd Interior Stain.
2) Moore or equal: Benwood Penetrating Stain #234.
3) P & L or equal: S-Series Tonetic Wood Stain.
4) S-W or equal: Oil Stain A-48 Series.

b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 4900 WoodWorks Quick-Dry Clear Sealer.
2) Moore or equal: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.
3) P & L or equal: H-40 Sanding Sealer.
4) S-W or equal: ProMar Varnish Sanding Sealer B26V3.

c. Second, Third, and Fourth Coats: Paste wax as recommended by the manufacturer.

E. Natural-Finish Woodwork: Provide the following natural finishes over new, interior woodwork:

1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.

a. Filler Coat (On Open-Grained Wood): Paste-wood filler applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: None required.
2) Moore or equal: Benwood Paste Wood Filler #238.
3) P & L or equal: None required.
4) S-W or equal: Sher-Wood Fast-Dry Filler.

b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 4900 WoodWorks Quick-Dry Clear Sealer.
2) Moore or equal: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.
3) P & L or equal: H-40 Sanding Sealer.
4) S-W or equal: ProMar Varnish Sanding Sealer B26V3.

c. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 4600 WoodWorks Alkyd Satin Varnish.
2) Moore or equal: Benwood Satin Finish Varnish #404.
3) P & L or equal: H24 38 Clear Finish Gloss.
4) S-W or equal: Oil Base Varnish, Gloss A66V91.

2. Wax-Polished Finish: 3 finish coats of paste wax over a sanding-sealer first coat.

a. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

1) Devoe or equal: 4900 WoodWorks Quick-Dry Clear Sealer.
2) Moore or equal: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.
3) P & L or equal: H-40 Sanding Sealer.
4) S-W or equal: ProMar Varnish Sanding Sealer B26V3.

b. Second, Third, and Fourth Coats: Paste wax as recommended by the manufacturer.

F. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

1) Devoe or equal: 13101 Mirrolac Rust Penetrating Metal Primer.
2) Moore or equal: IronClad Retardo Rust-Inhibitive Paint #163.
3) P & L or equal: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.

1) Devoe or equal : 34XX Wonder-Tones Interior Latex Eggshell Enamel.
2) Moore or equal : Moore's Regal AquaVelvet #319.
3) P & L or equal: Z/F 4000 Series Accolade Interior Velvet.

2. Semi-gloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater and a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils.

1) Devoe or equal: 13101 Mirrolac Rust Penetrating Metal Primer.
2) Moore or equal: IronClad Retardo Rust-Inhibitive Paint #163.
3) P & L or equal: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.

b. Undercoat: Alkyd, interior enamel undercoat or semigloss, acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

1) Devoe or equal: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
2) Moore or equal : Moore's Alkyd Enamel Underbody #217.
3) P & L or equal: Z/F 4100 Series Accolade Interior Semi-Gloss.

c. Finish Coat: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils.

1) Devoe or equal: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
2) Moore or equal : Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
3) P & L or equal: Z/F 4100 Series Accolade Interior Semi-Gloss.

G. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

1) Devoe or equal: 13201 Mirrolac Galvanized Metal Primer.
2) Moore or equal: IronClad Galvanized Metal Latex Primer #155.
3) P & L or equal: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils.

1) Devoe or equal: 34XX Wonder-Tones Interior Latex Eggshell Enamel.
2) Moore or equal: Moore's Regal AquaVelvet #319.
3) P & L or equal : Z/F 4000 Series Accolade Interior Velvet.

2. Hollow Metal Doors & Frames (and where scheduled) - Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils.

1) Devoe or equal: 13201 Mirrolac Galvanized Metal Primer.
2) Moore or equal: IronClad Galvanized Metal Latex Primer #155.
3) P & L or equal: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils.

1) Devoe or equal: 39XX Wonder-Tones Semi-Gloss Interior Latex Enamel.
2) Moore or equal: Moore's Regal AquaGlo Vinyl-Acrylic Latex Enamel #333.
3) P & L or equal: Z/F 4100 Series Accolade Interior Semi-Gloss.

END OF SECTION 09 90 00

SECTION 10 14 23.16 - 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 room-identification signs that are directly attached to the building.

1.3 ALLOWANCES

A. Allowances for room-identification signs 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 8-inch (200-mm) 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 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. Variable Component Materials: 12 replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
2. Tools: One set(s) of specialty tools for assembling signs and replacing variable sign components.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer of products or an entity that employs installers and supervisors who are trained and approved by manufacturer.

1.11 FIELD CONDITIONS

A. Field Measurements: Verify locations of anchorage devices and electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.12 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" and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

A. Room-Identification Sign per drawings with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Takeform

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: Manufacturer's standard for size of sign 0.125 inch (3.18 mm) 0.25 inch (6.35 mm).
b. Surface-Applied Graphics: Applied vinyl film.
c. Subsurface Graphics: Reverse etch image Snap-in changeable insert beneath removable face sheet Slide-in changeable insert.
d. Color(s): As selected by Architect from manufacturer's full range.

3. Sign-Panel Perimeter: Finish edges smooth.

a. Manufacturer's Standard Edge and Corner Conditions.
b. Finish and Color: As selected by Architect and Owner from manufacturer's full range.

4. Mounting: Manufacturer's standard method for substrates.

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 SIGN MATERIALS

A. Aluminum Sheet and Plate: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Acrylic Sheet: ASTM D4802, 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 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.

2.4 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 or stainless-steel 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 flathead screws and bolts with tamper-resistant spanner-head slots unless otherwise indicated.

4. 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. Adhesive: As recommended by sign manufacturer.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch (1.14 mm) thick, with adhesive on both sides.

D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

2.5 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.

C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

D. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. Furnish two blank inserts for each sign for Owner's use.
2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that inhibit function. Furnish initial changeable insert. Subsequent changeable inserts are by Owner Furnish two blank inserts for each sign for Owner's use.
3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. Subsequent changeable sign panels are by Owner.

2.6 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.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.

B. Color Anodic Finish: AAMA 611, Class II, 0.010 mm or thicker.

C. 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 as indicated on Drawings and 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.
5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch (6.35 mm) away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
6. Magnetic 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.

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.

END OF SECTION 10 14 23.16

SECTION 10 21 13.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Phenolic-core toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach floor-and-ceiling-anchored compartments to overhead structural system.
2. Section 108010 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings: For toilet compartments.

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show ceiling grid, ceiling-mounted items, and overhead support or bracing locations.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch- (152-mm-) square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Door Hinges: One hinge(s) with associated fasteners.
2. Latch and Keeper: One latch(es) and keeper(s) with associated fasteners.
3. Door Bumper: One door bumper(s) with associated fasteners.
4. Door Pull: One door pull(s) with associated fasteners.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARMENTS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Phenolic-core toilet compartments:

a. Global Partitions.
b. Columbia Partitions.
c. Bradley COrp.

B. Toilet-Enclosure Style: Floor mounted

C. Urinal-Screen Style: Floor mounted.

D. Door, Panel, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with

eased and polished edges and no-sightline system. Provide minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels.

E. Urinal-Screen Construction: Matching panel construction.

F. Pilaster Shoes: Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

G. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.

H. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; aluminum.

I. Phenolic-Panel Finish:

1. Facing Sheet Finish: One color and pattern in each room.
2. Color and Pattern: As selected by Architect from manufacturer's full range with manufacturer's standard dark color core.
3. Edge Color: Manufacturer's standard

2.3 HARDWARE AND ACCESSORIES

A. Manufacturer's Standard Operating Hardware and Accessories:

1. Material: Chrome-plated zamac.
2. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
3. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors and entrance-screen doors.

B. Manufacturer's Heavy-Duty Operating Hardware and Accessories:

1. Hinges: Manufacturer's minimum 0.062-inch- (1.59-mm-) thick stainless steel continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through-bolts.
2. Latch and Keeper: Manufacturer's heavy-duty surface-mounted cast-stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through-bolts.
3. Door Pull: Manufacturer's heavy-duty cast-stainless steel pull at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through-bolts.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for

through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

A. Aluminum Castings: ASTM B26/B26M.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M)..

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Floor-Mounted Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Door Size and Swings: Unless otherwise indicated, provide 28-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

    a. Pilasters and Panels: 1/2 inch (13 mm).
    b. Panels and Walls: 1 inch (25 mm).

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

    a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
    b. Align brackets at pilasters with brackets at walls.

B. Floor-Mounted Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches (44 mm) into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging door and doors in entrance screens to return doors to fully closed position.

END OF SECTION 10 21 13.17

SECTION 10 26 22 – OPERABLE PANEL PARTITIONS

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. Manually operated, paired panel operable partitions.

B. Related Sections include the following:
   1. Division 03 Sections for concrete tolerances required.
   2. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
   3. Division 09 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.

B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.

C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 *Standard Practice for Architectural Application and Installation of Operable Partitions.*

D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.

1.4 REFERENCE STANDARDS

A. ASTM International
   1. ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
   2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
   3. ASTM C1036 - Standard Specification for Flat Glass.
   4. ASTM C1048 - Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass.
   5. ASTM E84 - Surface Burning Characteristics of Building Materials.
   6. ASTM E413 - Classification for Rating Sound Insulation

B. Health Product Declaration Collaborative
   1. Health Product Declaration Open Standard v2.1

C. International Standards Organization
   1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
   2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
   3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
   4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
   5. ISO 21930 – Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.

D. Other Standards
   1. ADA – Americans with Disabilities Act.
   2. ANSI Z97.1 - Safety Glazing Materials Used in Buildings.
   3. CPSC 16 CFR 1201 - Safety Standard for Architectural Glazing Materials.
   4. NEMA LD3 - High Pressure Decorative Laminates.

1.5 SUBMITTALS

A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.

B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.

C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.

D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.

E. Reports: Provide a complete and unedited written sound test report indicating test specimen matches product as submitted.

F. Create spaces that are healthy for occupants.
   1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.

B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.7 WARRANTY

A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.

B. Warranty period: Two (2) years.

C. Suspension System Warranty:
   1. Multi-Purpose Room: Five (5) years.

PART 2 – PRODUCTS

2.1 PRODUCTS AND OPERATION

A. Products: Basis of design or equal:
   1. Multi-Purpose Room: Approximate size 14'-6" high x 33'-0" long, Modernfold, Inc., Acousti-Seal Premier - Paired Panel: Manually operated paired panel operable partition or Approved equal.

2.2 OPERATION

A. Multi-Purpose Room: Acousti-Seal Premier - Paired Panel: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals.

B. Final Closure:
   1. Multi-Purpose Room: Horizontally expanding panel edge with removable crank

2.3 PANEL CONSTRUCTION

A. Multi-Purpose Room: Nominal 3-inch (76mm) thick panels in manufacturer's standard 48-inch (1220mm) widths. All panel horizontal and vertical framing members fabricated from minimum 18-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.

B. Panel skin shall be:
   1. Multi-Purpose Room: 0.50-inch (13mm) tackable 100% recycled gypsum board, class "A" rated single material or composite layers continuously bonded to panel frame. Acoustical ratings of panels with this construction minimum:
      a. 47 STC

C. Hinges for Panels, Closure Panels, Pass Doors, and Pocket Doors shall be:
   1. Multi-Purpose Room: Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.

D. Panel Trim: No vertical trim required or allowed on edges of panels; minimal groove appearance at panel joints.

E. Panel Weights:
   1. Multi-Purpose Room: 47 STC - 7 lbs./square foot

2.4 PANEL FINISH

A. Panel finish shall be:
   1. Multi-Purpose Room: Reinforced heavy duty vinyl with woven backing weighing not less 30 ounces (850 grams) per lineal yard.

B. Panel Trim: Exposed panel trim of one consistent color:
   1. Multi-Purpose Room: To Be Advised

2.5 SOUND SEALS

A. Vertical Interlocking Sound Seals between panels: Roll-formed steel astragals, with reversible tongue and groove configuration in each panel edge for universal panel operation. Rigid plastic or aluminum astragals or astragals in only one panel edge are not acceptable.

B. Horizontal Top Seals: Continuous contact extruded vinyl bulb shape with pairs of non-contacting vinyl fingers to prevent distortion without the need for mechanically operated parts.

C. Horizontal bottom floor seals shall be:
   1. Multi-Purpose Room: Modernfold SM2 Bottom Seal. Manually activated seals providing nominal 2" (51mm) operating clearance with an operating range of + 0.50" (13mm) to -1.50" (38mm). Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds (54 kg) downward force to the floor throughout operating range.

2.6 SUSPENSION SYSTEM

A. Multi-Purpose Room: #17 Suspension System
   1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
      a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
   2. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.

2.7 OPTIONS

A. Pass Doors:

B. Single Pass Doors:
   1. Multi-Purpose Room: Matching pass door same thickness and appearance as the panels. ADA compliant pass door equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.

B. Install operable partitions and accessories after other finishing operations, including painting have been completed.

C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer’s written instructions.

B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

A. Demonstrate proper operation and maintenance procedures to Owner's representative.
B. Provide Operation and Maintenance Manual to Owner's representative.

END OF SECTION 10 26 22

SECTION 10 52 20 - FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES

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. Fire extinguishers.
2. Fire extinguisher cabinets.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for 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.

1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain extinguishers and cabinets from one source from a single manufacturer.

B. Coordination: Verify that cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.

C. UL-Listed Products: Fire extinguishers shall be UL listed with UL listing mark for type, rating, and classification of extinguisher.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. J.L. Industries.
2. Larsen's Manufacturing Co.
3. Potter-Roemer, Inc.

2.2 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each cabinet and other locations indicated, in colors and

finishes selected by Architect from manufacturer's standard, that comply with authorities having jurisdiction.

B. Multipurpose Dry Chemical Type: UL-rated 2A:10B:C, 10-lb nominal capacity, in enameled steel container.

1. Extent: Provide one per cabinet or one with wall bracket as called for – MP10 Fire extinguisher by Larsen's Manufacturing Company.

C. Wet-Chemical Type UL-rated 2-A:1-B:C:K, [2.5-gal. (9.5-L)] nominal capacity, with potassium acetate, citrate, or carbonate-based chemical in stainless-steel container; with pressure-indicating gage at Catering.

2.3 MOUNTING BRACKETS

A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish.

1. Provide standard bracket #5525 for extinguishers (Larsen's Manufacturing Company or equal) located in cabinets.

2.4 CABINETS

A. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated as follows:

1. Semi recessed Cabinet by Larsen's Manufacturing Company Architectural Series or equal, "Full Glass" door style with tempered glass, model AL 2409 6R, semi-recessed. Vertical, die cut, red lettering. Provide cabinets as shown on plans

2.5 FINISHES FOR CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary strippable protective covering prior to shipping.

2.6 ALUMINUM CABINET FINISHES

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. Class II Clear Anodized Finish: AA-M12C22A31 (Mechanical Finish: as fabricated, nonspecular; Chemical Finish: etched, medium matte; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Follow manufacturer's printed instructions for installation.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Fasten mounting brackets and cabinets to structure, square and plumb.

END OF SECTION 10 52 20

SECTION 10 53 00 – ALUMINUM CANOPIES

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, shall apply to work specified in this section.

1.2 GENERAL DESCRIPTION OF WORK

A. Work in this section shall include design, fabrication and installation of complete welded, extruded aluminum canopy system. All work shall be in complete accordance with the drawings and this specification.

1.3 REFERENCES

A. Aluminum Design Manual 2000, Specifications and Guidelines for Aluminum Structures.

B. ASCE 7, Minimum Design Loads for buildings and Other Structures.

C. American Architectural Manufacturers Association (AAMA)

D. American Society for Testing and Materials (ATSM)

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product information, specifications and installation instructions for components and accessories.

B. Shop Drawings: Submit complete erection drawings showing attachment system, column and gutter beam framing, transverse cross sections, covering and trim details, and option installation details to clearly indicate proper assembly of components. Detailed shop drawings shall be submitted, sealed by a State Registered Structural Engineer.

C. Certification: Submit written Certification prepared and signed by a State Registered Structural Engineer verifying that framing design will safely resist wind uplift as computed by ANSI A58.1, IV=150, Exposure C, as well as meet indicated loading requirements of the International Building Code and wind loading requirements of ANSI/ASCE/-98, live and dead loads and other load requirements.

D. Design Engineering of attachment surfaces are covered in the structural drawings.

1.5 QUALITY ASSURANCE

A. Codes and standards: Comply with provisions of the following except as otherwise indicated: Latest addition with amendments, if any. AWS (American Welding Society) standards for structural aluminum welding.

B. Manufacturer: Obtain aluminum covered walkway system from only one (1) manufacturer.

C. Installer Qualifications: Firm with not less than three (3) years experience in installation of aluminum walkway covers of type, quantity and installation methods similar to work of this section.

D. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where possible, to insure proper fitting of work.

E. Coordination: Coordinate work of this section with work of other sections which interface with covered walkway system.

1.6 WARRANTY

A. Provide manufactures standard one-year warranty that shall include, but not limited to, coverage for structural, water tightness and finish beginning the day of Substantial Completion of Installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design or equal: Walkway covers and canopies by:
Tennessee Valley Metals, Inc.
190 Industrial Park Road
Oneonta, AL 35121
205.274.9500
800-551-2579
sales@tvmetals.com
www.tvmetals.com

B. Masa Architectural Canopies, Extrudeck, Piscataway, NJ

C. Abrams Architectural Products, Atlanta, GA

2.2 MATERIALS

A. Aluminum Extrusions: All sections shall be extruded aluminum 6063 alloy, heat treated to T-6 temper.

B. Finishes:
1. For flouropolymer (Kynar) finish, AAMA 605.2, three coats.

C. Colors: As indicated on drawings.

2.3 COMPONENTS

A. Columns: Columns shall be radius-cornered tubular extrusion of size shown on drawings with cutout and internal diverter for drainage where indicated. Circular downspout opening in column is not acceptable.

B. Beams: Beams shall be open-top tubular extrusion of size and shape shown on drawings, top edges thickened for strength and designed to receive deck members in self-flashing manner. Structural ties shall be installed in tops of all beams.

C. Deck: Deck shall be extruded self-flashing sections interlocking into a composite unit.

D. Fascia: Fascia shall be manufacturer's standard materials in shapes shown on drawings. Size as indicated on drawings.

E. Flashing: Flashing shall be .032 aluminum (min.) to match canopy color. All thru-wall flashing is completed by others.

F. Soffit: Flush linear soffit with cavity capable of housing conduit, cabling and recessed light fixtures.

2.4 FABRICATION

A. Drainage: Water shall drain internally from deck to beams to columns, for discharge out to rain diverters at our below ground level as indicated on architectural drawings.

B. Deck Construction: Deck shall be manufactured of extruded modules that interlock in a self-flashing manner. Interlocking joints shall be positively fastened at 18" O.C. creating a monolithic structural unit capable of developing the full strength of the sections. The fastenings must have minimum shear strength of 350 pounds each. Deck shall be assembled with sufficient camber to offset dead load deflection.

PART 3 - EXECUTION

3.1 PREPARATION

A. Erection shall be performed after all concrete, masonry, and roofing work in the vicinity is complete and cleaned.

3.2 INSTALLATION

A. Column Sleeves: Per manufacturer's standard installation details and installed by the General Contractor.

B. Erection: Protective cover shall be erected true to line, level and plumb.

3.3 CLEANING

A. All protective cover components shall be cleaned promptly after installation.

3.4 PROTECTION

A. Extreme care shall be taken to protect materials during and after installation.

END OF SECTION 10 53 00

SECTION 10 80 10 – TOILET & BATH ACCESSORIES

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. Toilet and bath accessories.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.

B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.

C. Samples: For each accessory item to verify design, operation, and finish requirements.

1. Approved full-size Samples will be returned and may be used in the Work.

D Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices..

E. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on drawings in product schedule.

F. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

1.5 PROJECT CONDITIONS

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.

2.2 MATERIALS, GENERAL

A. Stainless Steel: AISI Type 302/304, with No. 4 finish (satin), 0.034 inch minimum thickness, unless otherwise indicated.

B. Brass: ASTM B 19, leaded and unleaded flat products: ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04 inch minimum. Surface preparation and metal pretreatment as required for applied finish.

D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).

D. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.

F. Baked-Enamel Finish: Factory-applied, gloss-white, baked-acrylic-enamel coating.

G. Mirror Glass: ASTM C 1036, Type 1, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

H. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

I. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2 inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction without mitered corners. Hang doors and access panels full-length, stainless-steel hinge. Provide anchorage that is Fully concealed when unit is closed.

D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.

1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with non-absorptive filler material. Corrugated cardboard is not acceptable filler material.

E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft resistant installation, as follows:

1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

F. Keys: Provide universal keys for internal access to toilet accessory units requiring internal access for servicing, resupplying, etc. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate with other trades the installation of blocking, supports and anchors required to mount recessed and surface mounted accessories. Coordinate with the Architect in a timely manner the exact location and height of accessories to insure substrates have been prepared to accept the fixtures and design loads imposed on the accessories.

B. General Contractor to be responsible for coordinating with other trades to insure countertops and/or wall hung lavatories are prepared to receive accessories listed. Coordinate size/location of holes for lavatory mounted soap dispensers to avoid conflicts with sink bowls and water supplies and to insure spout overhangs lavatory edge as recommended by dispenser manufacturer.

3.2 INSTALLATION

A. Install toilet accessory units according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units plumb, level, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's written instructions for type of substrate involved.

3.3 ADJUSTING AND CLEANING

A. Adjust toilet accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

PART 4 - BATH AND TOILET ACCESSORY SCHEDULE:

A. GENERAL

1. Basis-of-design accessories scheduled are based on products manufactured by Bobrick Washroom Equip-ment, Inc or equal. Refer to Plumbing & Accessory Legend on drawings for accessory model numbers. Other listed manufacturers offering products equal in quality, function and appear-ance may be substituted. Obtain all accessories from a single manufacturer.
2. Location and mounting heights to be determined by Architect. Accessories in Handicap Toilets to be mounted per the Americans with Disabilities Act - Accessibility Guidelines (ADAAG).

END OF SECTION 10 80 10

SECTION 11 40 00 – FOODSERVICE EQUIPMENT

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, shall apply to work specified in this section.

1.2 GENERAL DESCRIPTION OF WORK

A. Work in this section shall include design, fabrication and installation of foodservice equipment in and adjacent to Concession space. All work shall be in complete accordance with the drawings and this specification.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product information, specifications and installation instructions for components and accessories.

1.4 WARRANTY

A. Provide manufacturers standard warranties for foodservice equipment beginning the day of Substantial Completion of Installation.

PART 2 - PRODUCTS

2.1 FOODSERVICE DESIGNER

A. Basis-of-Design or equal:
KESCO, located at 7930 Front Beach Road
Panama City Beach, FL 32407
or Approved equal.

2.2 COMPONENTS

A. Kitchen Equipment: As indicated on drawings and attached foodservice specification manual.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate equipment installation after mechanical, electrical and plumbing rough-in utility work in the vicinity is complete and cleaned.

3.2 PROTECTION

A. Extreme care shall be taken to protect materials during and after installation.

Item # _____ C.S.I. Section 11420

RESTAURANT RANGES

ENDURANCE GAS RESTAURANT RANGE
4 OPEN BURNERS
24" WIDE GAS RANGE

Model 24S-4N
(shown with optional casters)

- ☐ **24S-4BN** 1 Standard Oven / Natural Gas
- ☐ **24S-4BP** 1 Standard Oven / Propane

STANDARD FEATURES

- Fully MIG welded frame
- Stainless steel front, sides, backriser, lift-off high shelf
- 6" stainless steel adjustable legs
- Four open top burners, each burner is 30,000 BTU/hr. with lift-off burner heads
- Shrouded flash tube pilot system (one pilot per two burners)
- Heavy duty cast grates, easy lift-off 12" x 12½" in front and 12" x 14½" in the rear
- Extra deep pull out crumb tray with welded corners
- 23,000 BTU/hr. baker's depth standard oven cavity. Full size sheet pans fit front-to-back
- Oven thermostat adjusts from 250°F to 500°F
- Two oven racks and four rack positions
- One year limited parts and labor warranty

ACCESSORIES (Packaged & Sold Separately)

- ☐ Extra oven rack with rack guides
- ☐ Casters (set of four)
- ☐ Leveling casters (set of four)
- ☐ Flanged feet (set of four)
- ☐ 10" stainless steel stub back

OPTIONS (Factory Installed)

- ☐ Flame Safety device with manual spark ignition for all open top burners, thermostatic griddles and oven pilots
- ☐ Hot tops

SPECIFICATIONS

24" wide gas restaurant range, Vulcan Model No. 24S-4BN. Fully MIG welded aluminized steel frame for added durability. Stainless steel front, sides, backriser, highshelf and 6" adjustable legs. Extra deep crumb tray with welded corners. Four 30,000 BTU/hr. open top burners with lift-off burner heads. Energy saving flashtube open burner ignition system (one pilot for every two burners) shrouded for reliability. Heavy duty cast grates, easy lift-off 12" x 12½" in the front and 12" x 14½" in the back to better accommodate stock pots or large pans. Grates have a built in aeration bowl for greater efficiency. Burner knobs are cool to the touch, high temperature material. One oven: 23,000 BTU/hr. standard bakers depth ovens with porcelain oven bottom and door panel, measures 26¼"d x 20¼"w x 14"h. Oven thermostat adjusts from 250°F to 500°F with a low setting. Oven is supplied with two racks, two rack guide sets, and four rack positions. Oven door is heavy duty with an integrated door hinge/spring mechanism requiring no adjustment. ¾" rear gas connection and pressure regulator. Total input 143,000 BTU/hr.

Exterior Dimensions:
34"d x 24"w x 58"h on 6" adjustable legs

VULCAN
a division of ITW Food Equipment Group LLC
P.O. Box 696 ■ Louisville, KY 40201 ■ Toll-free: 1-800-814-2028 ■ Local: 502-778-2791 ■ Quote & Order Fax: 1-800-444-0602

RESTAURANT RANGES

ENDURANCE GAS RESTAURANT RANGE
4 OPEN BURNERS
24" WIDE GAS RANGE

INSTALLATION INSTRUCTIONS

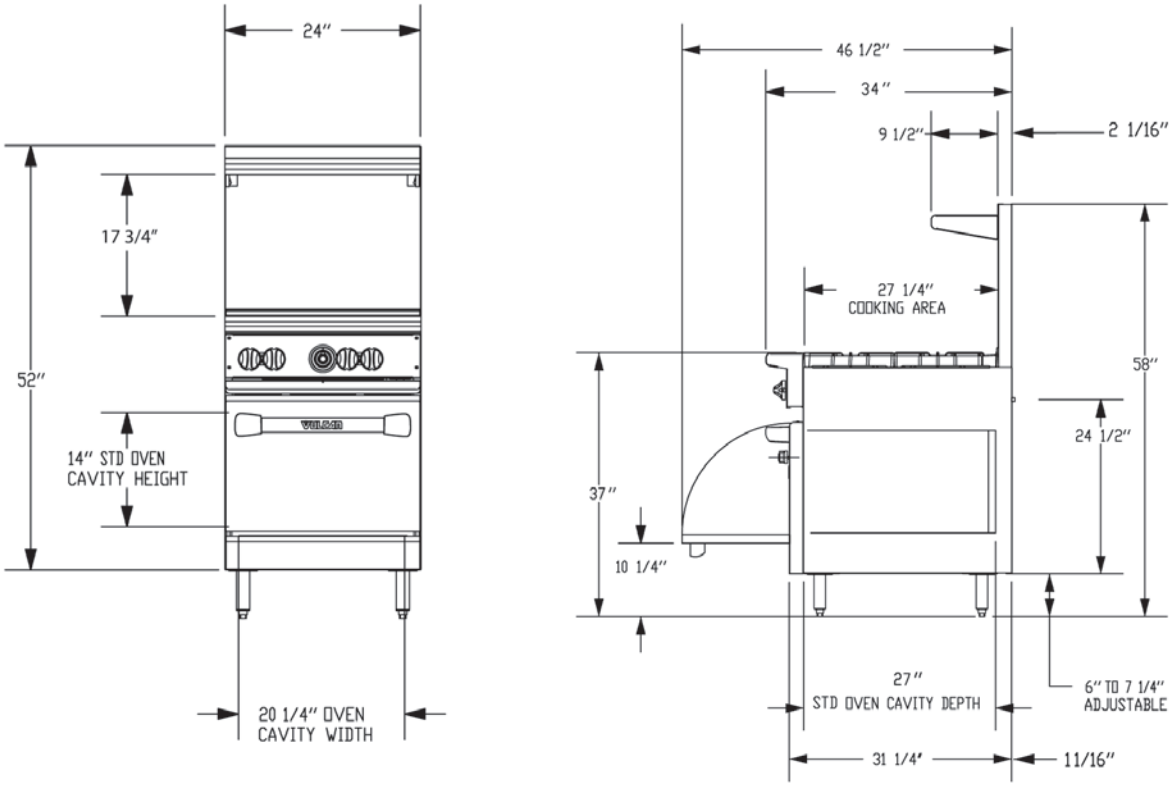
1. A pressure regulator sized for this unit is included. Natural gas 5.0" W.C., propane gas 10.0" W.C.
2. Gas line connecting to range must be ¾" or larger. If flexible connectors are used, the inside diameter must be ¾" or larger.
3. An adequate ventilation system is required for commercial cooking equipment. Information may be obtained by writing to the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269, www.NFPA.org. When writing, refer to NFPA No. 96.
4. These units are manufactured for installation in accordance with ANSZ223.1A (latest edition), National Fuel Gas Code. Copies may be obtained from The American Gas Association, 400 N Capitol St. NW, Washington, DC 20001, www.AGA.org.
5. **Clearances**

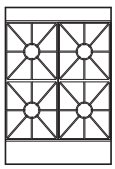
	Rear	Sides
Combustible	6"	10"
Standard Oven Non-combustible	0"	0"
Convection Oven Non-combustible	Min. 4"	0"

6. For proper combustion, install equipment on adjustable legs or casters provided with unit.

NOTE: In line with its policy to continually improve its product, Vulcan reserves the right to change materials and specifications without notice.

Specify type of gas when ordering.
Specify altitude when above 2,000 feet.



TOP CONFIGURATION	MODEL NUMBER	DESCRIPTION	TOTAL INPUT BTU / HR	SHIPPING WEIGHT LBS / KG
	**24S-4BN**	1 Standard Oven / 4 Burners / Natural Gas	143,000	350 / 159
	24S-4BP	1 Standard Oven / 4 Burners / Propane	143,000	350 / 159

This appliance is manufactured for commercial use only and is not intended for home use.

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"TO COOK NICELY!"
Toll Free: 855-855-0399 Email: info@atosausa.com
www.atosa.com | www.atosausa.com
California, Colorado, Florida, Georgia, Illinois, Massachusetts, New Jersey, Ohio, Texas, Washington

MODELS:

ATFS-40 / ATFS-50 / ATFS-75

Fryers

Standard Features

- Stainless steel exterior and interior
- Welded stainless steel tank
- Heavy duty burners with a standing flame, standby pilots
- High quality millivolt thermostat(T-Stat) maintains select temperature automatically between 200°F-400°F
- Oil cooling zone in the bottom of the tank captures food particles and extends oil life
- Safety valve with an automatic voltage stabilizing function
- Self-reset high temperature limiting device
- Two(2) nickel plated baskets with coated handles standard
- Wire crumb rack and basket hanger standard
- Available in Natural & Propane gas
- 3/4 " NPT rear gas connection and regulator
- Four(4) casters standard

Optional Accessories

- Leg kit part #: 301110006
- Fryer splash guard

ATFS-40

ATFS-50

ATFS-75

1 YR WARRANTY ON ALL PARTS AND LABOR (US ONLY)
5 YEARS OIL TANK WARRANTY

Intertek 4003935 Intertek 4003935

Conforms to ANSI STD Z83.11b-2009 (2011)
Certified to CSA STD 1.8b-2009 (2011)
Conforms to NSF/ANSI STD.4

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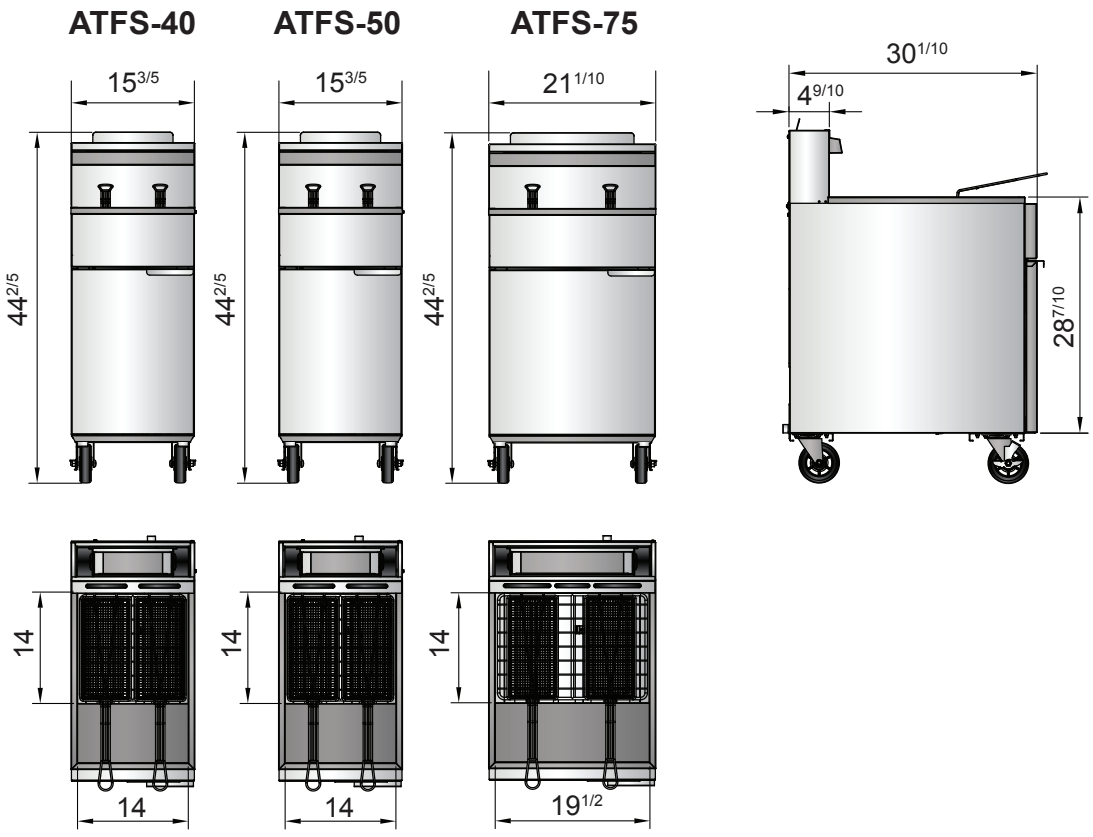
SPECIFICATIONS

Models	Burners and Control Method	Gas Type	Intake-Tube Pressusre (in.W.C.)	Per BTU B.T.U./h	Total BTU B.T.U./h	Regulator	Basket Dimensions (inch)	Exterior Dimensions (inch)	Net Weight (lbs)	Gross Weight (lbs)
ATFS-40	3 Burners, Independent Manual Control	NG	4	34,000	102,000	4" w.c.	$13^{3/10}\times6^{1/2}\times5^{9/10}$	$15^{3/5}\times30^{1/10}\times44^{2/5}$	131	160
		LP	10	30,000	90,000	10" w.c.				
ATFS-50	4 Burners, Independent Manual Control	NG	4	34,000	136,000	4" w.c.	$13^{3/10}\times6^{1/2}\times5^{9/10}$	$15^{3/5}\times30^{1/10}\times44^{2/5}$	143	171
		LP	10	30,000	120,000	10" w.c.				
ATFS-75	5 Burners, Independent Manual Control	NG	4	34,000	170,000	4" w.c.	$13^{3/10}\times9^{3/10}\times5^{9/10}$	$21^{1/10}\times30^{1/10}\times44^{2/5}$	168	200
		LP	10	30,000	150,000	10" w.c.				

PLAN VIEW

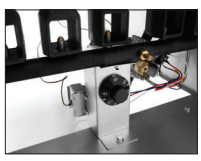


Stainless steel tank

Baskets

Basket hanger

Temperature limiting device



Item # _____ C.S.I. Section 11420

GRIDDLES & BROILERS

VCRG-T RESTAURANT SERIES
GAS GRIDDLES

Model VCRG48-T

- ☐ **VCRG24-T** 24" w x 20½" d griddle plate
- ☐ **VCRG36-T** 36" w x 20½" d griddle plate
- ☐ **VCRG48-T** 48" w x 20½" d griddle plate

STANDARD FEATURES

- 1" thick polished steel griddle plate welded to 3¼" stainless steel back, tapered side splashes and stainless steel grease trough.
- Fully welded stainless and aluminized steel chassis frame.
- 12½" cooking height on 4" adjustable legs.
- One 25,000 BTU/hr. "U" shaped aluminized steel burner for every 12" of griddle width.
- One embedded, mechanical snap action thermostat per burner for high performance and optimal response time.
- Temperature adjust from 200° to 450°F.
- One pilot safety valve for every two burners. Safety will completely shut off gas to pilot and burners if pilot extinguishes.
- High capacity 4½ quart capacity grease can.
- ¾" rear gas connection and convertible gas pressure regulator for LP service.
- Constructed standard for natural gas service. LP conversion kit supplied with unit.
- One year limited parts and labor warranty.

SPECIFICATIONS

Low profile Vulcan Model No._____. Stainless steel front, sides and front top ledge. Fully welded stainless and aluminized steel body frame. 12½" cooking height on 4" legs. 1" thick polished steel griddle plate welded to stainless steel back and tapered side splashes. One 25,000 BTU/hr. "U" shaped aluminized steel burner and embedded, mechanical snap action thermostat for each 12" of griddle width. Temperature adjusts from 200° to 450°F. One pilot safety for every two burners. 4½ quart capacity grease can. ¾" rear gas connection and convertible gas pressure regulator for LP service.

Exterior Dimensions:
_____" w x 27" d x 16" h on 4" legs.

CSA design certified. NSF listed.

NOTE: Models are constructed standard for natural gas service. Propane conversion kit is supplied with the unit. Conversion is the customer's responsibility. Please indicate propane or natural gas when processing your order.

NOTE: Elevation orifice kit is available free of charge for high-elevation applications. Installation is the customer's responsibility. Please indicate elevation when processing your order.

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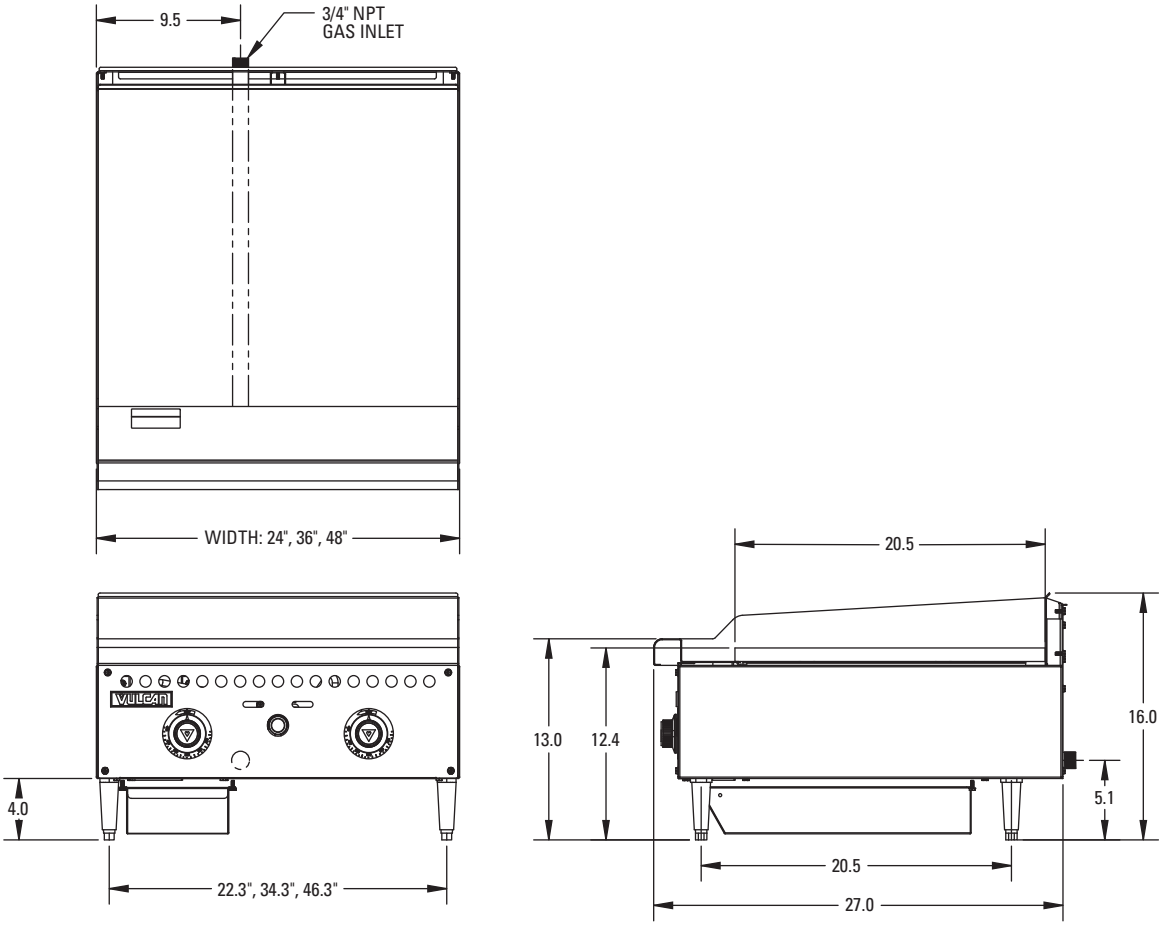
GRIDDLES & BROILERS

VCRG-T RESTAURANT SERIES
GAS GRIDDLES

INSTALLATION INSTRUCTIONS

1. A gas pressure regulator supplied with the unit must be installed;
   Natural Gas 4.0" (102 mm) W.C.
   Propane Gas 10.0" (254 mm) W.C.
2. All models require a 6" (152 mm) clearance at both sides and rear adjacent to combustible and 0" from non-combustible constructions. All models require a 4" (102mm) bottom clearance and must be installed with minimum 4" legs.
   An adequate ventilation system is required for Commercial Cooking Equipment (NFPA No. 96). Information may be obtained by writing to the National Fire Protection Association, Batterymarch Park, Quincy, MA 02169.
3. These units are manufactured for installation in accordance with National Fuel Gas Code, ANSI-Z223.1/NFPA #54 (latest edition). Copies may be obtained from The American Gas Association, Accredited Standards Committee Z223 @ 400 N. Capital St. NW, Washington, DC 20001, or the Secretary Standards Council, NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471.
   NOTE: In The Commonwealth of Massachusetts
   All gas appliances vented through ventilation hood or exhaust system equipped with a damper or with a power means of exhaust shall comply with 248 CMR.
4. This appliance is manufactured for commercial installation only and is not intended for home use.



MODEL	WIDTH	DEPTH	OVERALL HEIGHT*	WORKING HEIGHT*	NO. OF BURNERS	TOTAL BTU/HR	NO. OF DRAWERS	APPROX. SHIP. WT.
VCRG24-T	24"	27"	16"	12½"	2	50,000	1	243 lbs/111 kg
VCRG36-T	36"	27"	16"	12½"	3	75,000	1	340 lbs/155 kg
VCRG48-T	48"	27"	16"	12½"	4	100,000	1	408 lbs/185 kg

*These are nominal dimensions and can vary by +1.75" with adjustable legs.

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ADVANCE TABCO
SMART FABRICATION™

ECONOMY EQUIPMENT STANDS NSF

Item #: _____ Qty #: _____
Model #: _____
Project #: _____

Featuring as Standard:
"THE PROVEN"
ORIGINAL ADVANCE TABCO
Adjustable Undershelf with Die Cast Leg Clamp

FEATURES:

TOP is furnished with 1" hemmed edge turned up at both sides; 1" turn up at rear.

Undershelf is adjustable.

Aluminum die cast "leg to shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts.

CONSTRUCTION:

All TIG welded. Exposed weld areas finished to match adjacent surfaces.

Entire Top is mechanically polished to a satin finish and is sound deadened.

Galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat sections.

MATERIAL:

TOP is 16 gauge stainless steel type "304" series with galvanized understructure.

SHELF is galvanized steel.

LEGS are 1 5/8" diameter galvanized steel with plastic bullet feet.

	24" WIDE			30" WIDE		
L	Model	Wt.	Cu. Ft.	Model	Wt.	Cu. Ft.
15"	--	--	--	EG-LG-3015-X	24 lbs.	2
18"	--	--	--	EG-LG-3018-X	31 lbs.	2
24"	EG-LG-242-X	33 lbs.	2	EG-LG-302-X	37 lbs.	3
30"	--	--	--	EG-LG-300-X	42 lbs.	3
36"	EG-LG-243-X	46 lbs.	3	EG-LG-303-X	55 lbs.	4
48"	EG-LG-244-X	59 lbs.	4	EG-LG-304-X	68 lbs.	5
60"	EG-LG-245-X	73 lbs.	5	EG-LG-305-X	81 lbs.	7
72"	EG-LG-246-X	92 lbs.	6	EG-LG-306-X	101 lbs.	8

NOTE: "L" = Clear (inside nominal) dimension
Overall length = "L" + 1/4"

Load Capacity = 600 lbs. Distributed Weight

OPTIONAL X.H.D. CASTERS
TA-25EG-X

Set of 4 Supplied w/ 2 Brakes.
(200 lbs. Load Capacity Per Caster)

ADVANCE TABCO
SMART FABRICATION™
www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 8:00 pm E.S.T.

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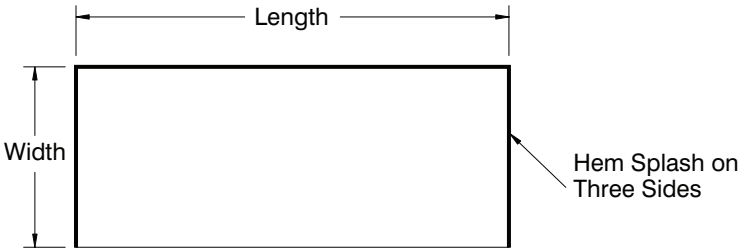
Email: customer@advancetabco.com or **Fax:** 631-242-6900

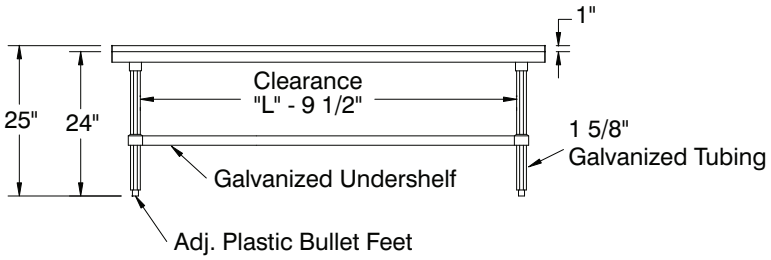
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

REF-O

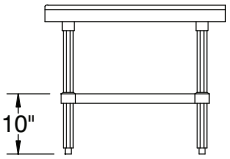
DETAILS and SPECIFICATIONS

TOL ± .500” ALL DIMENSIONS ARE TYPICAL





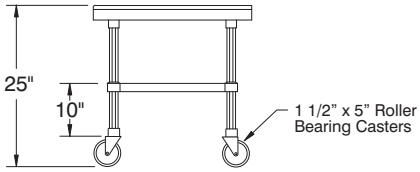
24” Working Height



Mobile Unit

OPTIONAL X.H.D. CASTERS
TA-25EG-X

Set of 4 Supplied w/ 2 Brakes.
(200 lbs. Load Capacity Per Caster)



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Parts Dept. (800)424-TRUE • Parts Dept. Fax# (636)272-9471 • www.truemfg.com

Project Name: _____
Location: _____
Item #: _____ *Qty:* _____
Model #: _____

AIA #
SIS #

Model:
T-49F-HC

T-Series:
Reach-In Solid Swing Door Freezer with Hydrocarbon Refrigerant

T-49F-HC

- True's solid door reach-in's are designed with enduring quality that protects your long term investment.
- Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains -10°F (-23.3°C) temperatures. Ideal for both frozen foods and ice cream.
- Stainless steel solid doors and front. The very finest stainless with higher tensile strength for fewer dents and scratches.
- Adjustable, heavy duty PVC coated shelves.
- Positive seal self-closing doors. Lifetime guaranteed door hinges and torsion type closure system.
- Automatic defrost system time-initiated, temperature-terminated. Saves energy consumption and provides shortest possible defrost cycle.

Bottom mounted units feature:

- "No stoop" lower shelf.
- Storage on top of cabinet.
- Compressor performs in coolest, most grease free area of kitchen.
- Easily accessible condenser coil for cleaning.

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Cabinet Dimensions (inches) (mm) W	D	H*	HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
T-49F-HC	2	6	54⅛ 1375	29½ 750	78⅜ 1991	1 1	115/60/1 230-240/50/1	9.6 5.5	5-15P ▲	9 2.74	480 218

* Height does not include 5" (127 mm) for castors or 6" (153 mm) for optional legs.

▲Plug type varies by country.

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APPROVALS:

AVAILABLE AT:

Model:
T-49F-HC

T-Series:
Reach-In Solid Swing Door Freezer with Hydrocarbon Refrigerant

STANDARD FEATURES

DESIGN
- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains -10°F (-23.3°C) temperatures. Ideal for both frozen foods and ice cream.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Bottom mounted condensing unit positioned for easy cleaning. Compressor runs in coolest and most grease free area of the kitchen. Allows for storage area on top of unit.
- Automatic defrost system time-initiated, temperature-terminated. Saves energy consumption and provides shortest possible defrost cycle.

CABINET CONSTRUCTION
- Exterior - Stainless steel front. Anodized quality aluminum ends. Corrosion resistant GalFan coated steel back.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Insulation - entire cabinet structure and solid door are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- Welded, heavy duty steel frame rail, black powder coated for corrosion protection.
- Frame rail fitted with 4" (102 mm) diameter stem castors - locks provided on front set.

DOORS
- Stainless steel exterior with clear aluminum liner to match cabinet interior. Doors extend full width of cabinet shell. Door locks standard.
- Lifetime guaranteed recessed door handles. Each door fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Positive seal self-closing doors. Lifetime guaranteed door hinges and torsion type closure system.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

SHELVING
- Six (6) adjustable, heavy duty PVC coated wire shelves 24 9/16"L x 22 3/8"D (624 mm x 569 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on ½" (13 mm) increments.

LIGHTING
- LED Interior lighting - safety shielded. Lights activated by rocker switch mounted above doors.

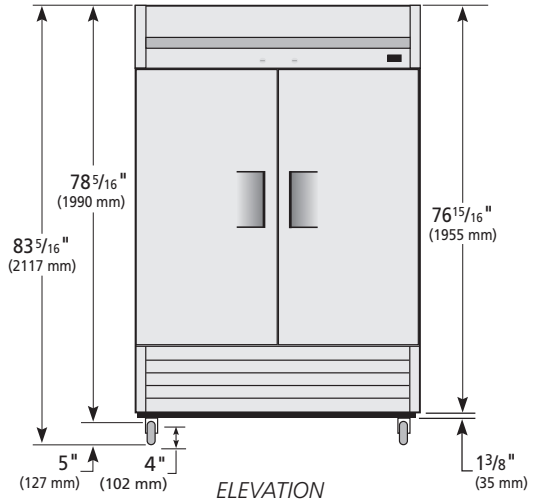
MODEL FEATURES
- Exterior temperature display.
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- Rear airflow guards prevent product from blocking optimal airflow.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL
- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

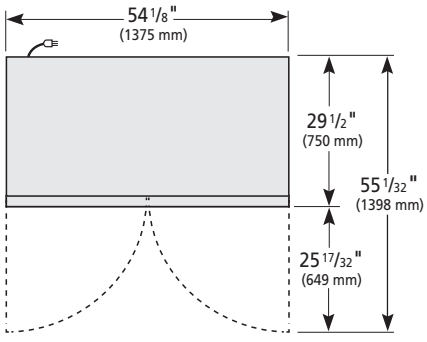
115/60/1
NEMA-5-15R

OPTIONAL FEATURES/ACCESSORIES
Upcharge and lead times may apply.
- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs.
- ❑ 6" (153 mm) seismic/flanged legs.
- ❑ Alternate door hinging (factory installed).
- ❑ Novelty baskets.
- ❑ Additional shelves.
- ❑ Half door bun tray racks. Each holds up to eleven 18"L x 26"D (458 mm x 661 mm) sheet pans (sold separately) (airflow guards need to be removed).
- ❑ Full door bun tray racks. Each holds up to twenty-two 18"L x 26"D (458 mm x 661 mm) sheet pans (sold separately) (airflow guards need to be removed).

PLAN VIEW



ELEVATION



PLAN VIEW

3 YEAR PARTS + LABOR 7 YEAR COMPRESSOR
WARRANTY
(U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

KCL	Model	Elevation	Right	Plan	3D	Back
	T-49F-HC					

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Parts Dept. (800)424-TRUE • Parts Dept. Fax# (636)272-9471 • www.truemfg.com

Project Name: _____
Location: _____
Item #: _____ *Qty:* _____
Model #: _____

AIA #
SIS #

Model:
T-49-HC

T-Series:
Reach-In Solid Swing Door Refrigerator with Hydrocarbon Refrigerant

T-49-HC

- True's solid door reach-in's are designed with enduring quality that protects your long term investment.
- Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- Adjustable, heavy duty PVC coated shelves.
- Positive seal self-closing doors. Lifetime guaranteed door hinges and torsion type closure system.

Bottom mounted units feature:

- "No stoop" lower shelf.
- Storage on top of cabinet.
- Compressor performs in coolest, most grease free area of kitchen.
- Easily accessible condenser coil for cleaning.

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Cabinet Dimensions (inches) (mm) W	D	H*	HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
T-49-HC	2	6	54⅛ 1375	29½ 750	78⅜ 1991	½ ⅓	115/60/1 230-240/50/1	5.4 2.4	5-15P ▲	9 2.74	450 205

* Height does not include 5" (127 mm) for castors or 6" (153 mm) for optional legs.

▲ Plug type varies by country.

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APPROVALS:

AVAILABLE AT:

Model:
T-49-HC

T-Series:
Reach-In Solid Swing Door Refrigerator with Hydrocarbon Refrigerant

STANDARD FEATURES

DESIGN
- True's commitment to using the highest quality materials and over sized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Bottom mounted condensing unit positioned for easy maintenance. Compressor runs in coolest and most grease free area of the kitchen. Allows for storage area on top of unit.

CABINET CONSTRUCTION
- Exterior - Stainless steel front. Anodized quality aluminum ends. Corrosion resistant GalFan coated steel back.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Insulation - entire cabinet structure and solid door are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- Welded, heavy duty steel frame rail, black powder coated for corrosion protection.
- Frame rail fitted with 4" (102 mm) diameter stem castors - locks provided on front set.

DOORS
- Stainless steel exterior with clear aluminum liner to match cabinet interior. Doors extend full width of cabinet shell. Door locks standard.
- Lifetime guaranteed recessed door handles. Each door fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Positive seal self-closing doors. Lifetime guaranteed door hinges and torsion type closure system.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

SHELVING
- Six (6) adjustable, heavy duty PVC coated wire shelves 24 9/16"L x 22 3/8"D (624 mm x 569 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on ½" (13 mm) increments.

LIGHTING
- LED Interior lighting - safety shielded. Lights activated by rocker switch mounted above doors.

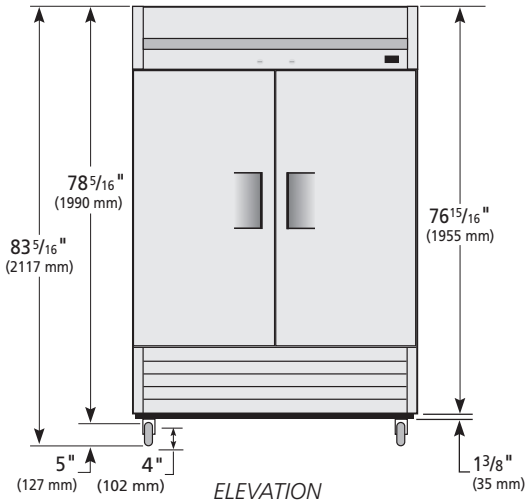
MODEL FEATURES
- Exterior temperature display.
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL
- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

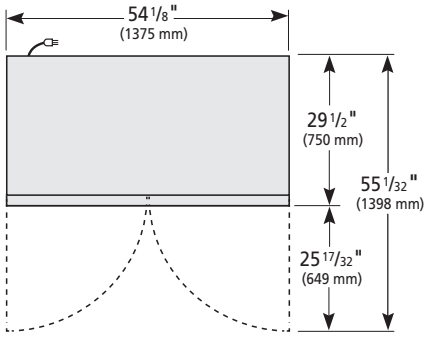
115/60/1
NEMA-5-15R

OPTIONAL FEATURES/ACCESSORIES
Upcharge and lead times may apply.
- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs.
- ❑ 6" (153 mm) seismic/flanged legs.
- ❑ 2 ½" (64 mm) standard legs.
- ❑ Alternate door hinging (factory installed).
- ❑ Half door bun tray racks. Each holds up to eleven 18"L x 26"D (458 mm x 661 mm) sheet pans (sold separately).
- ❑ Full door bun tray racks. Each holds up to twenty-two 18"L x 26"D (458 mm x 661 mm) sheet pans (sold separately).

PLAN VIEW



ELEVATION



PLAN VIEW

3 YEAR PARTS + LABOR / 7 YEAR COMPRESSOR
WARRANTY
(U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model	Elevation	Right	Plan	3D	Back
T-49-HC					

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Project Name: _____ *AIA #*

Location: _____

Item #: _____ *Qty:* _____ *SIS #*

Model #: _____

Model:
TSSU-48-12-HC

Food Prep Table:
Solid Door Sandwich/Salad Unit with Hydrocarbon Refrigerant

TSSU-48-12-HC

- True's salad/sandwich units are designed with enduring quality that protects your long term investment.
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- Patented forced-air design holds 33°F to 41°F (.5°C to 5°C) product temperature in food pans and cabinet interior.
- Complies with ANSI/NSF-7.
- All stainless steel front, top and ends. Corrosion resistant GalFan coated steel back.
- Stainless steel, patented, foam insulated lid and hood keep pan temperatures colder, lock in freshness and minimize condensation. Removable for easy cleaning.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- 11¾" (299 mm) deep, ½" (13 mm) thick, full length removable cutting board included. Sanitary, high density, NSF approved white polyethylene provides tough preparation surface.
- Heavy duty PVC coated wire shelves.
- Foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Pans (top)	Cabinet Dimensions (inches) (mm) W	D†	H*	HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
TSSU-48-12-HC	2	4	12	48⅜ 1229	30⅛ 766	36¾ 934	⅓ ⅓	115/60/1 230-240/50/1	5.8 2.3	5-15P ▲	11 3.35	340 155

† Depth does not include 1" (26 mm) for rear bumpers.
* Height does not include 6¼" (159 mm) for castors or 6" (153 mm) for optional legs.

▲Plug type varies by country.

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APPROVALS:

AVAILABLE AT:

Model:
TSSU-48-12-HC

Food Prep Table:
Solid Door Sandwich/Salad Unit with Hydrocarbon Refrigerant

STANDARD FEATURES

DESIGN
- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydrocarbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- Energy efficient, factory balanced refrigeration system with guided airflow to provide uniform temperature in food pans and cabinet interior.
- Patented forced-air design holds 33°F to 41°F (.5°C to 5°C) product temperature in food pans and cabinet interior. Complies with ANSI/NSF-7.
- Sealed, self-lubricating evaporator fan motor and larger fan blades give True sandwich/salad units a more efficient, low velocity, high volume airflow design.
- Condensing unit access in back of cabinet, slides out for easy maintenance.

CABINET CONSTRUCTION
- Exterior - stainless steel front, top and ends. Corrosion resistant GalFan coated steel back.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Insulation - entire cabinet structure and solid doors are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 5" (127 mm) diameter stem castors - locks provided on front set. 36" (915 mm) work surface height.

DOORS
- Stainless steel exterior with white aluminum liner to match cabinet interior.
- Each door fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Positive seal self-closing doors with 90° stay open feature. Doors swing within cabinet dimensions.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

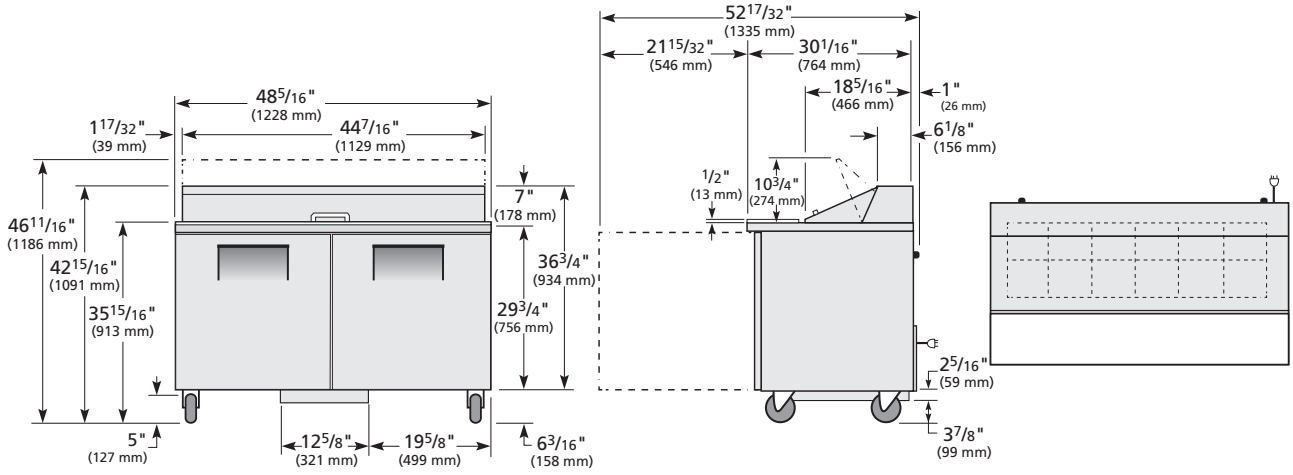
SHELVING
- Four (4) adjustable, heavy duty PVC coated wire shelves 21 9/16"L x 16"D (548 mm x 407 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on ½" (13 mm) increments.

MODEL FEATURES
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- 11¾" (299 mm) deep, ½" (13 mm) thick, full length removable cutting board. Sanitary, high-density, NSF approved white polyethylene provides tough preparation surface.
- Stainless steel, patented, foam insulated lid(s) and hood keep pan temperatures colder, lock in freshness and minimize condensation. Removable for easy cleaning.
- Comes standard with 12 (⅙size) 6⅞"L x 6¼"W x 4"D (175 mm x 159 mm x 102 mm) clear polycarbonate, NSF approved, food pans in countertop prep area. Also accommodates 6" (153 mm) deep food pans (supplied by others).
- Countertop pan opening designed to fit varying size pan configurations with available pan divider bars. Varying size pans supplied by others.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL
115/60/1
NEMA-5-15R

OPTIONAL FEATURES/ACCESSORIES
Upcharge and lead times may apply.
- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs.
- ❑ 6" (153 mm) seismic/flanged legs.
- ❑ 2½" (64 mm) diameter castors.
- ❑ Barrel locks (factory installed). Requires one per door.
- ❑ Additional shelves.
- ❑ Single overshelf.
- ❑ Double overshelf.
- ❑ Flat lid.
- ❑ Sneezeguard.
- ❑ 19" (483 mm) deep,½" (13 mm) thick, white polyethylene cutting board. Requires "L" brackets.
- ❑ 19" (483 mm) deep,¾" (20 mm) thick, white polyethylene cutting board. Requires "L" brackets.
- ❑ 11¾" (299 mm) deep,½" (13 mm) thick, composite cutting board. Requires "L" brackets.
- ❑ 19" (483 mm) deep,½" (13 mm) thick, composite cutting board. Requires "L" brackets.
- ❑ Crumb catcher. Requires crumb catcher cutting board for proper installation.
- ❑ Pan dividers.
- ❑ Exterior rectangular digital temperature display (factory installed).
- ❑ ADA compliant model with 34" (864 mm) work surface height.

PLAN VIEW



ELEVATION *RIGHT VIEW* *PAN LAYOUT*

WARRANTY
Three year warranty on all parts and labor and an additional 2 year warranty on compressor. (U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model	Elevation	Right	Plan	3D	Back
TSSU-48-12-HC	TFNY04E	TFNY02S	TFNY04P	TFNY043	

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Parts Dept. (800)424-TRUE • Parts Dept. Fax# (636)272-9471 • www.truemfg.com

Project Name: _____
Location: _____
Item #: _____ *Qty:* _____
Model #: _____

AIA #
SIS #

Model:
TUC-48F-HC

Undercounter:
Solid Door Freezer with Hydrocarbon Refrigerant

TUC-48F-HC

- True's undercounter units are designed with enduring quality that protects your long term investment.
- Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- Oversized, environmentally friendly forced-air refrigeration system holds -10°F (-23.3°C). Ideally suited for both frozen foods and ice cream.
- All stainless steel front, top and ends. Corrosion resistant GalFan coated steel back.
- Interior - attractive, NSF approved, clear coated aluminum liner with stainless steel floor.
- Heavy duty PVC coated wire shelves.
- Automatic defrost system time-initiated, time-terminated.
- Foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Cabinet Dimensions (inches) (mm) W	D†	H*	HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
TUC-48F-HC	2	4	48⅜ 1229	30⅛ 766	29¾ 756	½ ⅓	115/60/1 230-240/50/1	3.2 1.8	5-15P ▲	7 2.13	275 125

† Depth does not include 1" (26 mm) for rear bumpers.
* Height does not include 6¼" (159 mm) for castors or 6" (153 mm) for optional legs.

▲Plug type varies by country.

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APPROVALS:

AVAILABLE AT:

Model:
TUC-48F-HC

Undercounter:
Solid Door Freezer with Hydrocarbon Refrigerant

STANDARD FEATURES

DESIGN
- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydrocarbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- Energy efficient, factory balanced refrigeration system with guided airflow to provide uniform product temperatures.
- High capacity, factory balanced refrigeration system that maintains -10°F (-23.3°C) temperatures. Ideal for both frozen foods and ice cream.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Condensing unit access in back of cabinet, slides out for easy maintenance.
- Automatic defrost system time-initiated, time-terminated.

CABINET CONSTRUCTION
- Exterior - stainless steel front, top and ends. Corrosion resistant GalFan coated steel back.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Insulation - entire cabinet structure and solid doors are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 5" (127 mm) diameter stem castors - locks provided on front set. 36" (915 mm) work surface height.

DOORS
- Stainless steel exterior with clear aluminum liner to match cabinet interior.
- Each door fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Positive seal self-closing doors with 90° stay open feature. Doors swing within cabinet dimensions.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

SHELVING
- Four (4) adjustable, heavy duty PVC coated wire shelves 21 9/16"L x 16"D (548 mm x 407 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on ½" (13 mm) increments.

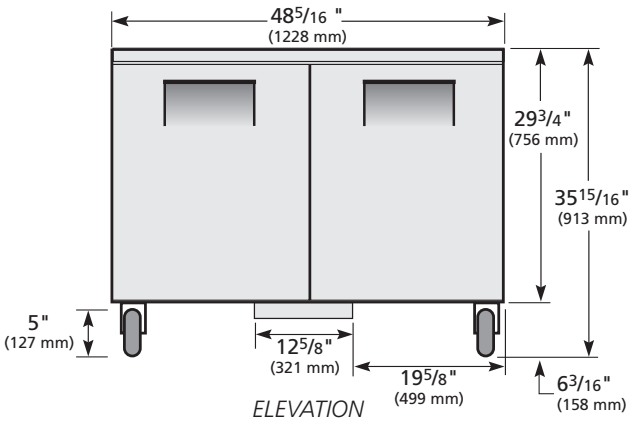
MODEL FEATURES
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL
- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

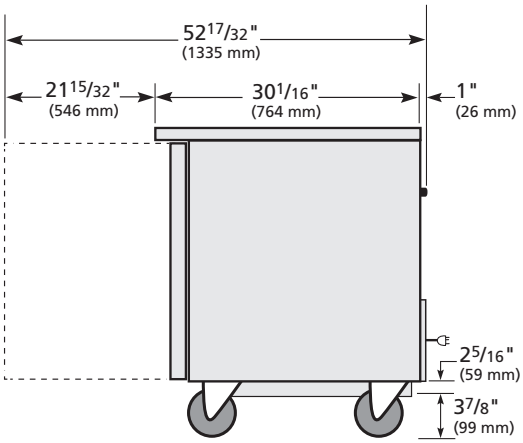
115/60/1
NEMA-5-15R

OPTIONAL FEATURES/ACCESSORIES
Upcharge and lead times may apply.
- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs.
- ❑ 6" (153 mm) seismic/flanged legs.
- ❑ 2½" (64 mm) diameter castors.
- ❑ Barrel locks (factory installed). Requires one per door.
- ❑ Single overshelf.
- ❑ Double overshelf.
- ❑ Stacking collar.
- ❑ 30" (762 mm) deep, ½" (13 mm) thick, white polyethylene cutting board. Requires "L" brackets.
- ❑ 30" (762 mm) deep, ½" (13 mm) thick, composite cutting board. Requires "L" brackets.
- ❑ Heavy duty 16 gauge tops.
- ❑ Exterior rectangular digital temperature display (factory installed).
- ❑ ADA compliant models with 34" (864 mm) work surface height.
- ❑ Low profile models with 31 7/8" (810 mm) work surface height.

PLAN VIEW



ELEVATION



RIGHT VIEW

WARRANTY
Three year warranty on all parts and labor and an additional 2 year warranty on compressor. (U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model	Elevation	Right	Plan	3D	Back
TUC-48F-HC	TFQY02E	TFQY02S	TFQY02P	TFQY023	

TRUE MANUFACTURING CO., INC.
2001 East Terra Lane • O'Fallon, Missouri 63366-4434 • (636)240-2400 • Fax (636)272-2408 • Toll Free (800)325-6152 • Intl. Fax# (001)636-272-7546 • www.truemfg.com

John BOOS Since 1887

ITEM #: _____ QTY: _____

MODEL #: _____

PROJECT NAME: _____

090618

3601 S. Banker St. Effingham, IL 62401 • P.O. BOX 609 • Ph: (888) 431-2667 • Fax: (800) 433-2667

"3B-2D" "B-SERIES" SINKS

FEATURES:

- 16GA STAINLESS STEEL
- TYPE 300 STAINLESS STEEL WITH #4 POLISH, SATIN FINISH
- 14" DEEP BOWLS
- ALL CORNERS, BOTH VERTICAL AND HORIZONTAL, COVED AT 3/4" RADIUS
- BOTTOMS OF BOWLS FORMED FOR DRAINAGE TO 3-1/2" DIAMETER DIE STAMPED OPENING
- FULL LENGTH **10" HIGH BOXED BACKSPLASH,** WITH 2" RETURN TO WALL AT 45 DEGREE AND 1" TURNED DOWN REAR LIP
- 1" FAUCET HOLES IN BACKSPLASH
- ALL OUTSIDE CORNERS OF ASSEMBLY ARE BULLNOSED TO PROVIDE SAFE, CLEAN, AND POLISHED EDGE
- STANDARD STAINLESS STEEL LEGS 1-5/8" DIAMETER

CONSTRUCTION:

- TOP: STAINLESS STEEL SINKS ARE TIG WELDED, EXPOSED WELDS ARE POLISHED TO MATCH ADJACENT SURFACE
- BASE: STAINLESS STEEL BASES ARE MIG WELDED

MATERIAL:

- BOWLS & TOP: 16GA TYPE 300 STAINLESS STEEL WITH #4 POLISH, SATIN FINISH
- LEGS: 1-5/8" ROUND O.D. STAINLESS STEEL
- BRACING: 1-1/4" ROUND O.D. STAINLESS STEEL
- GUSSETS: STAINLESS STEEL
- FEET: 1" ADJUSTABLE STAINLESS STEEL BULLET FEET

3B18244-2D18
(Model showing one set of faucet holes.)

STANDARD 16GA "3B-2D" "B-SERIES" SINK

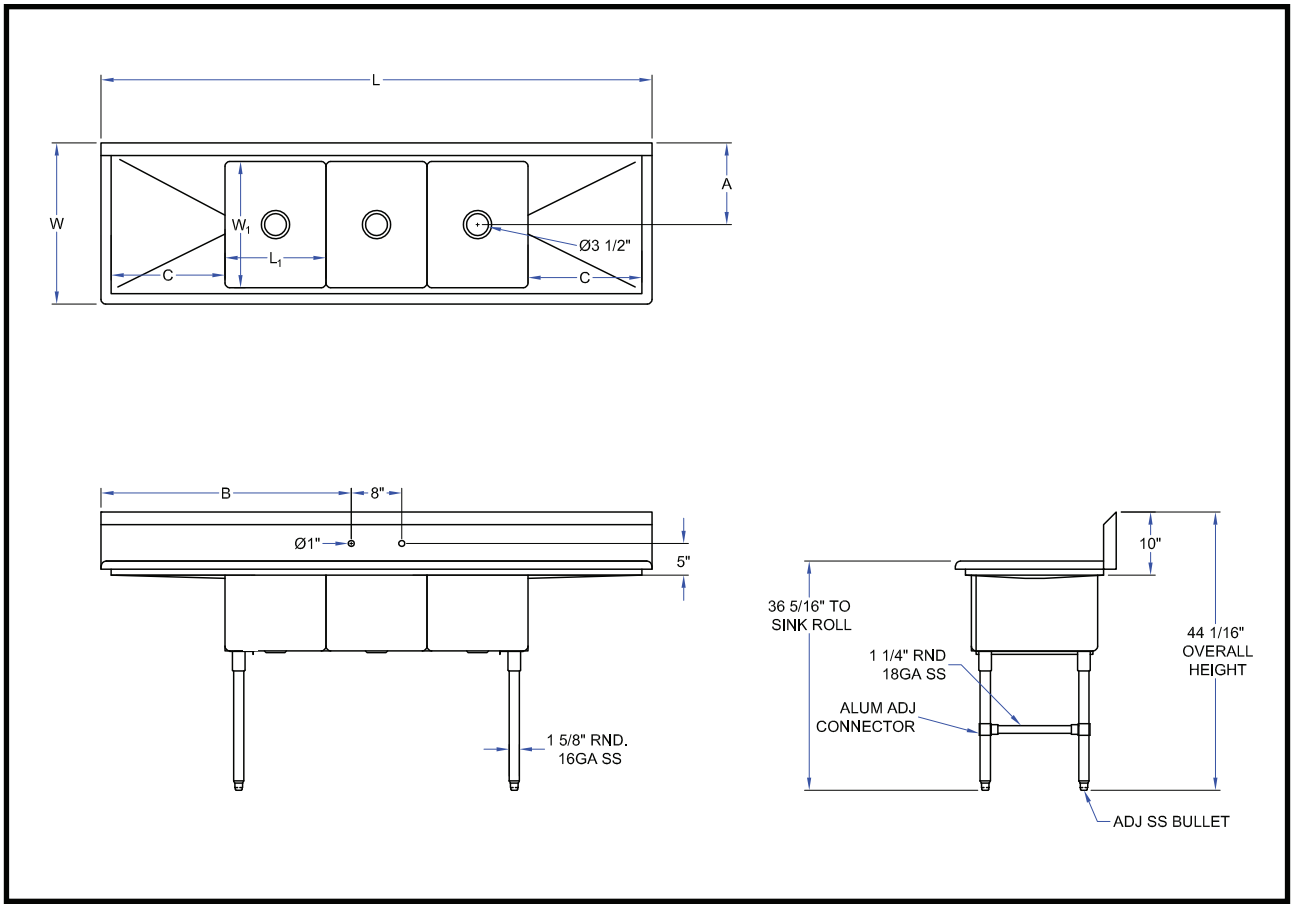
MODEL	QTY
3B16204-2D18	
3B16204-2D24	
3B16204-2D36	
3B184-2D18	
3B18244-2D18	
3B18244-2D24	
3B20304-2D20	
3B20304-2D24	
3B20304-2D30	
3B244-2D24 *	

* WITH TWO SETS OF FAUCET HOLES

OPTIONAL ACCESSORIES

DESCRIPTION	QTY
FAUCETS	
ADD-A-FAUCETS	
PRE-RINSE UNITS	
LEVEL WASTE	
OVERSHELVES	
POT RACK	

DETAILED SPECIFICATIONS



16GA - "3B-2D" "B SERIES" SINK

14" DEEP	L	W	L1	W1	A	B	C
3B16204-2D18	87-1/4"	25-1/2"	16"	20"	12-15/16"	39-5/8"	18"
3B16204-2D24	99-1/4"	25-1/2"	16"	20"	12-15/16"	45-5/8"	24"
3B16204-2D36	123-1/4"	25-1/2"	16"	20"	12-15/16"	57-5/8"	36"
3B184-2D18	93-1/4"	23-1/2"	18"	18"	11-15/16"	42-5/8"	18"
3B18244-2D18	93-1/4"	29-1/2"	18"	24"	14-15/16"	42-5/8"	18"
3B18244-2D24	105-1/4"	29-1/2"	18"	24"	14-15/16"	48-5/8"	24"
3B20304-2D20	103"	35-1/2"	20"	30"	18-3/16"	47-5/8"	20"
3B20304-2D24	111"	35-1/2"	20"	30"	18-3/16"	51-5/8"	24"
3B20304-2D30	123"	35-1/2"	20"	30"	18-3/16"	57-5/8"	30"
3B244-2D24 *	123-1/4"	29-1/2"	24"	24"	14-15/16"	45-5/8"	24"

* WITH TWO SETS OF FAUCET HOLES

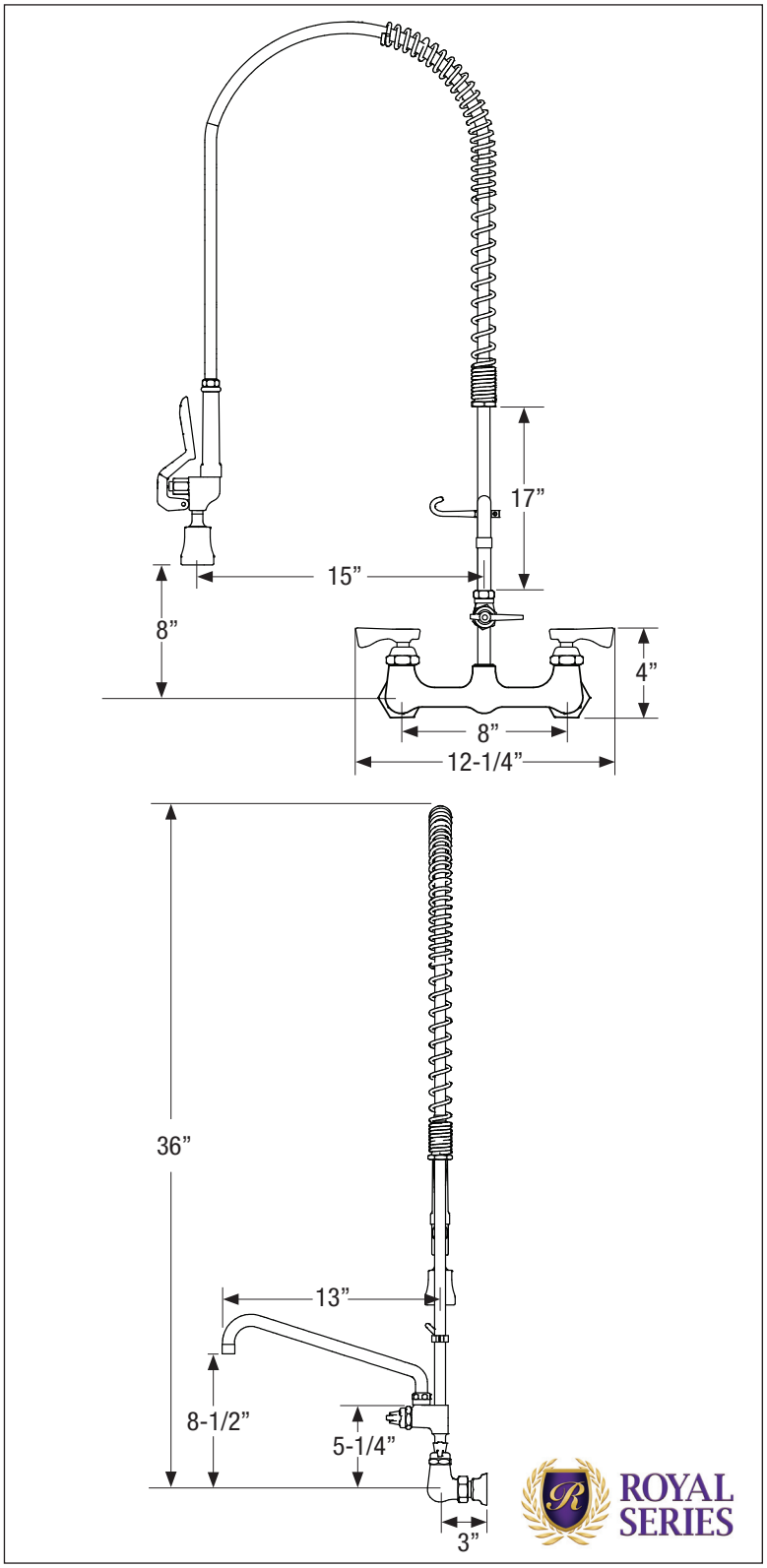
SOME UNITS SHIP UNASSEMBLED FOR REDUCED SHIPPING COST. ALL DIMENSIONS ARE TYPICAL. TOLERANCE +/- .500"

Model: 17-109WL Item #: _____ Date: _____

Project: _____ Qty: _____ Approved By: _____

8” Center Wall Mount Pre-Rinse w/ Add-On Faucet

ROYAL SERIES PLUMBING



Standard Features

- Pre-assembled to cut installation time
- Includes wall bracket with mounting hardware
- 1/4 turn ceramic cartridge valves
- 44” stainless steel hose with grip
- Interchangeable with most brands
- Built-in check valves
- Built for high volume
- Full replacement parts available

Specifications

- 8” Center Wall Mount with 1/2” NPT female inlets
- Add-On Faucet with 12” Spout
- 36” high w/ 15” overhang
- 1.2 GPM spray head
- Temperature range of 40° to 180°
- Riser Pipe with Hook: 3/8” NPT x 18”
- Mounting Kit Included:
  1/2” NPT x 1-1/2” male nipples with locknuts
- Shipping Weight: 15 lbs.
- Case Quantity: 3

Product Compliance

- NSF/ANSI 61-G
- ASME A112.18.1/CSA B125.1
- City of Los Angeles
- CEC Listed
- Commonwealth of Massachusetts

ASME A112.18.1/CSA B125.1

Certified to NSF/ANSI 61-G

Warning: This product can expose you to chemicals including lead and lead compounds which are known to the Sate of California to cause cnacer and birth defects or other reporductive harm. For ore information go to ww. PO65Warnings.ca.gov.

Krowne Metal Corporation • 100 Haul Rd. Wayne, NJ 07470 • Toll Free: (800) 631-0442 • Fax: (973) 872-1129 • sales@krowne.com • krowne.com

Rev. 7/2018 • No. 17-109WL

Model: 17-109WL Item #: _____ Date: _____

Project: _____ Qty: _____ Approved By: _____

8” Center Wall Mount Pre-Rinse w/ Add-On Faucet

ROYAL SERIES PLUMBING

Replacement Parts

NO.	Item	Model #
1	24” Spring	21-162
2	44” Hose w/ Grip	21-133L
3	Spray Head	21-129L
4	Hook Assembly	21-165
5	Spring Retainer	21-161L
6	Wall Bracket	21-137
7	18” Riser	21-160L
8	Add-On Faucet w/ 12” Spout	21-139L
9	8” Center Pre-Rinse Body	21-108L

ASME A112.18.1/CSA B125.1

Certified to NSF/ANSI 61-G

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Rev. 7/2018 • No. 17-109WL

ADVANCE TABCO
SMART FABRICATION™

STAINLESS STEEL

ECONOMY WORK TABLES

NSF

Item #: _____ Qty #: _____
Model #: _____
Project #: _____

FEATURES:

ELAG Top is furnished with 1 5/8" sanitary rolled rim on front and rear & square ends.

FLAG Top is furnished with 1 5/8" sanitary rolled rim on front and square ends, and 1 1/2" backsplash on rear.

KLAG Top is furnished with 1 5/8" sanitary rolled rim on front and square ends, and 5" backsplash at rear.

Two hat-channels stud welded under tabletop to reinforce and maintain a level work surface.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is fully adjustable.

CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surface.

Top is sound deadened.

Roll formed embossed galvanized hat channels are secured to top by means of structural adhesive and weld studs.

Gussets welded to support hat channels.

MATERIAL:

TOP: 16 gauge stainless steel type "430" series.
SHELF: 18 gauge galvanized steel.
LEGS: 1 5/8" diameter tubular galvanized steel. Galvanized steel gussets. 1" adjustable plastic bullet feet.

ELAG-X Series
Flat Top

Plastic Bullet Feet standard on ELAG, FLAG & KLAG Series

FLAG-X Series
1 1/2" Backsplash

KLAG-X Series
5" Backsplash

MADE IN THE USA

	L	Model #	WT.	Cu. Ft.	Model #	WT.	Cu. Ft.	Model #	WT.	Cu. Ft.
		FLAT TOP			1 1/2" SPLASH			5" SPLASH		
18" WIDE	24"	ELAG-182-X	37 lbs.	4	-			-		
	30"	ELAG-180-X	44 lbs.	4	-			-		
	36"	ELAG-183-X	47 lbs.	4	-			-		
	48"	ELAG-184-X	58 lbs.	5	-			-		
	60"	ELAG-185-X	66 lbs.	7	-			-		
	72"	ELAG-186-X	79 lbs.	8	-			-		
24" WIDE	24"	ELAG-242-X	44 lbs.	4	FLAG-242-X	44 lbs.	4	KLAG-242-X	48 lbs.	7
	30"	ELAG-240-X	50 lbs.	4	FLAG-240-X	50 lbs.	4	KLAG-240-X	55 lbs.	7
	36"	ELAG-243-X	56 lbs.	4	FLAG-243-X	56 lbs.	4	KLAG-243-X	61 lbs.	7
	48"	ELAG-244-X	69 lbs.	6	FLAG-244-X	69 lbs.	6	KLAG-244-X	75 lbs.	9
	60"	ELAG-245-X	80 lbs.	7	FLAG-245-X	80 lbs.	7	KLAG-245-X	89 lbs.	11
	72"	ELAG-246-X	95 lbs.	8	FLAG-246-X	95 lbs.	8	KLAG-246-X	102 lbs.	13
	84"	ELAG-247-X	108 lbs.	10	FLAG-247-X	108 lbs.	10	KLAG-247-X	117 lbs.	15
	96"	ELAG-248-X*	112 lbs.	11	FLAG-248-X*	112 lbs.	11	KLAG-248-X*	137 lbs.	17
30" WIDE	24"	ELAG-302-X	49 lbs.	5	FLAG-302-X	49 lbs.	5	KLAG-302-X	53 lbs.	8
	30"	ELAG-300-X	56 lbs.	5	FLAG-300-X	56 lbs.	5	KLAG-300-X	61 lbs.	8
	36"	ELAG-303-X	64 lbs.	5	FLAG-303-X	64 lbs.	5	KLAG-303-X	69 lbs.	8
	48"	ELAG-304-X	79 lbs.	7	FLAG-304-X	79 lbs.	7	KLAG-304-X	84 lbs.	11
	60"	ELAG-305-X	95 lbs.	8	FLAG-305-X	95 lbs.	8	KLAG-305-X	101 lbs.	13
	72"	ELAG-306-X	110 lbs.	10	FLAG-306-X	110 lbs.	10	KLAG-306-X	117 lbs.	16
	84"	ELAG-307-X	125 lbs.	12	FLAG-307-X	125 lbs.	12	KLAG-307-X	133 lbs.	18
	96"	ELAG-308-X*	131 lbs.	13	FLAG-308-X*	131 lbs.	13	KLAG-308-X*	140 lbs.	20
36" WIDE	36"	ELAG-363-X	73 lbs.	6	FLAG-363-X	73 lbs.	6	-		
	48"	ELAG-364-X	92 lbs.	8	FLAG-364-X	92 lbs.	8	-		
	60"	ELAG-365-X	111 lbs.	10	FLAG-365-X	111 lbs.	10	-		
	72"	ELAG-366-X	130 lbs.	12	FLAG-366-X	130 lbs.	12	-		
	96"	ELAG-368-X*	158 lbs.	15	FLAG-368-X*	158 lbs.	15	-		

All 8 ft. Tables Provided With 6 Legs

ADVANCE TABCO
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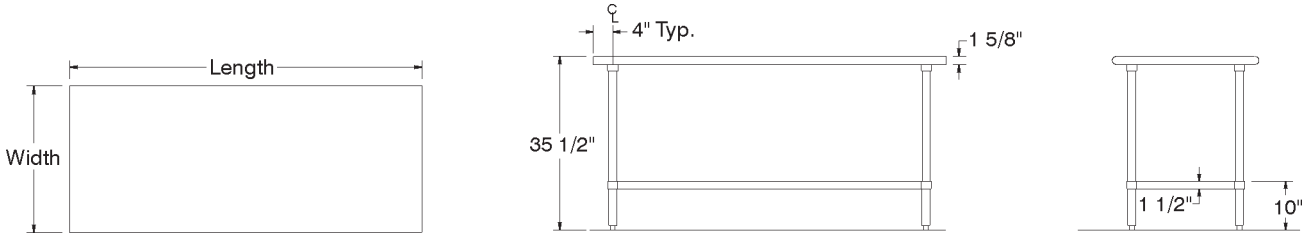
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or **Fax:** 631-586-2933

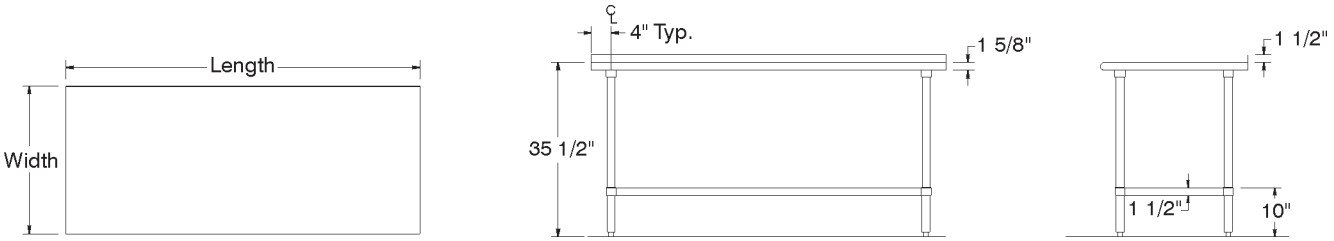
DETAILS and SPECIFICATIONS

TOL ± .500” ALL DIMENSIONS ARE TYPICAL

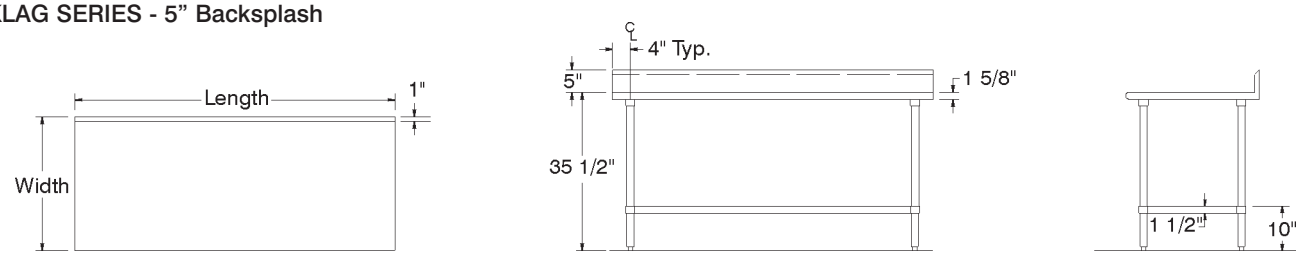
ELAG SERIES - Flat Top



FLAG SERIES - 1 1/2” Backsplash



KLAG SERIES - 5” Backsplash



Project _____

Item # _____

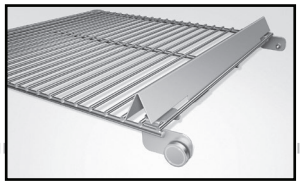
Quantity _____

Mini Display Warmers

Models: MDW-1X, -2X

The Hatco Mini Display Warmer holds and serves products like sandwiches, cookies and pretzels at temperatures up to 180°F (82°C). Perfect for convenience stores, restaurants, recreational facilities and theme parks, and anywhere there is limited counterspace. The non-humidified Mini Display Warmer allows food to be showcased on three magnetically adjustable shelves for maximum visibility. One or two-door models are available for server and self-serve operations. The optional hood with backlit sign cutout can be rotated to face any side. Unit available in *Designer* colors with black hood.

MDW-1X with standard Designer color and optional hood with backlit sign cut out on one side (sign included)



Magnetically adjustable shelves provide flexibility for a variety of product choices

Standard features

- Three magnetically adjustable shelves for horizontal or slanted displays provide flexibility for a variety of product choices
- Tempered glass sides and incandescent light to showcase food products
- Optional hood with backlit sign cutout (sign included) can be rotated to face any side
- Single door or pass-through models available. Doors are field reversible for right or left opening and can be on any side of the unit
- Thermostat control with rocker switch for precise temperature control

Options (available at time of purchase only)

Designer Colors – Non-standard colors are non-returnable – Black standard

☐Warm Red ☐Black ☐Gray Granite ☐White Granite
☐Navy Blue ☐Hunter Green ☐Antique Copper

☐Hood with Backlit Sign Cutout on One Side (Sign included) (Black only)

Accessories

☐Aluminum Tray

IFS anti-microbial coatings use naturally-occurring, environmentally sustainable, silver ions to help inhibit the growth of microbes on the powder coated surface. See www.hatcocorp.com/antimicrobial-paint for more information.

For operation, location and safety information, please refer to the Installation and Operating Manual.

ANSI/NSF 4

MADE IN THE USA

HATCO CORPORATION | P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. | (800) 558-0607 | (414) 671-6350

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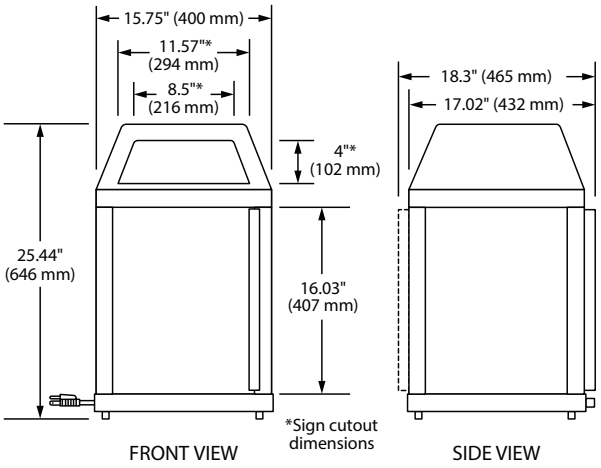
Mini Display Warmers

Models: MDW-1X, -2X



SPECIFICATIONS
Mini Display Warmers - Non-Humidified

The shaded areas contain electrical information for International models

Model	Description	Dimensions (W x D x H)	Cabinet Opening (W x H)	Volts	Watts	Amps	Plug	Ship Weight*
MDW-1X	1 Door with 3 shelves	15.75" x 17.02" x 25.44" (400 x 432 x 646 mm)	12.5" x 15.63" (318 x 397 mm)	120	470	3.9	NEMA 5-15P	46 lbs. (21 kg)
				230	510	2.2	CEE 7/7 Schuko, AS 3112, BS-1363	
MDW-2X	2 Doors with 3 shelves	15.75" x 18.3" x 25.44" (400 x 465 x 646 mm)	12.5" x 15.63" (318 x 397 mm)	120	470	3.9	NEMA 5-15P	53 lbs. (24 kg)
				230	510	2.2	CEE 7/7 Schuko, AS 3112, BS-1363	

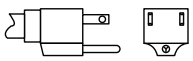
* Shipping weight includes packaging.

CORD LOCATION
Facing controls, bottom right corner.

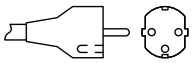
DOOR HINGES
Control Side: Left-hand side.
Customer Side (Two-door models only): Right-hand side.

PLUG CONFIGURATIONS

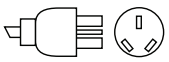
NEMA 5-15P



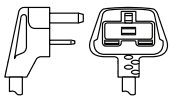
CEE 7/7 Schuko



AS 3112



BS-1363



PRODUCT SPECS
Mini Display Warmers

The Mini Display Warmer shall be a Model ... rated at ... volts and ... watts, as manufactured by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The Mini Display Warmer Cabinet shall have ... door(s), tempered glass sides and doors, and incandescent display light. It shall include a temperature selector dial, On/Off rocker switch, three adjustable shelves, and a 6' (1829 mm) cord with plug attached.

Warranty consists of 24/7 parts and service assistance (US and Canada only).

HATCO CORPORATION | P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. | (800) 558-0607 | (414) 671-6350

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Project:

Item Number:

Quantity:

CAYENNE® MODEL 2000 WARMER

Cayenne® Model 2000 Warmer

DESCRIPTION

The Cayenne® Model 2000 Warmer features a stainless steel well for easy cleaning and longer life.

PERFORMANCE CRITERIA

Cayenne® Model 2000 Warmer are designed to hold heated prepared foods at temperatures above the HACCP "danger zone" of 140° F (60° C). The performance standard is measured using the NSF mixture preheated to 165° F (73.9° C). The unit will hold the temperature of this product above 150° F (65.6° C). The temperature will be maintained best when the food product is held using pans with covers, the proper water level is maintained in the well, and the food product is stirred regularly.

MODELS

72000 Model 2000 Warmer (US/Canada)

FEATURES

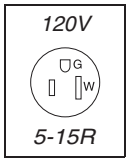
- ❑ Stainless steel well
- ❑ Capillary tube thermostat control supplies constant temperature and power only when needed for maximum power efficiency
- ❑ Front access dials for easy temperature setting and maintaining accuracy
- ❑ 10 temperature range settings, from approximately 80-85° F (27-30° C) to 200° F (94° C)
- ❑ Stainless steel exterior meets UL surface temperature standards for operator and customer safety and concentrates heat inside the well, not to the outside surface and rim
- ❑ Meets NSF4 Performance Standards for rethermalization and hot food holding equipment
- ❑ Non-skid feet help keep unit from sliding on countertop
- ❑ Bottom exit 6 ft. (183 cm) power cord adapts to receptacle location for safe installation and allows for 360˚ control placement

WARRANTY: All models shown come with Vollrath's standard warranty against defects in materials and workmanship. For full warranty details, please refer to the Vollrath Equipment and Smallwares Catalog.

SPECIFICATIONS

Item	Overall Dimensions (W X D x H) IN (CM)	Well Depth In (CM)	Voltage	Watts	Amps	Plug	Shipping Dimenions IN (CM)	Shipping Weight LB (KG)
72000	14 x 22 x 8½ (35.6 x 55.9 x 21.6)	6½ (16.6)	120	1000	8.3	5-15P	25 x 15¾ x 9⅛ (63.5 x 40 x 23.2)	19.5 (8.8)

Receptacle



Agency Listings

c UL us LISTED NSF

Due to continued product improvement, please consult www.vollrathco.com for current product specifications.

Approvals	Date

Setting the Standard™
www.vollrathco.com

The Vollrath Company, L.L.C.
1236 North 18th Street
Sheboygan, WI 53081-3201 U.S.A.
Customer Service: 800.628.0830
Canada Customer Service: 800.695.8560
Main Fax: 800.752.5620 or 920.459.6573

Technical Services: 800.628.0832
Technical Services Fax: 920.459.5462

 Form Number L35840 8/12
Printed in USA

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Cayenne® Model 1001 Warmer

- Features Vollrath's Direct Contact Heating System for energy efficiency and cool-to-touch exterior
- Thermostatic control supplies power only when needed for maximum efficiency
- Low water indicator light eliminates guesswork
- Recommend using up to 4" (10.2 cm) deep food pans

*International models only

ITEM #	DESCRIPTION	DIMENSIONS (W X D X H): IN (CM)	VOLTAGE	WATTS	AMPS	PLUG	CASE LOT
71001	Model 1001 full-size warmer only	13¾ x 21¾ x 9 (35.6 x 55.9 x 22.8)	120 AC	700	5.8	5-15P	1
INTERNATIONAL MODEL							
72620	Model 1001 full-size warmer only	13¾ x 21¾ x 9 (35.6 x 55.9 x 22.8)	230 AC	700	3.0	Schuko	1
72553	Model 1001 full-size warmer only	13¾ x 21¾ x 9 (35.6 x 55.9 x 22.8)	230 AC	700	3.0	UK	1

Cayenne® Model 2000 Warmer

- 300 series stainless steel 6½" (16.6 cm) deep well for easy cleaning and longer life
- Recommend using up to 4" (10.2 cm) deep food pans
- Recommend using moist heat

*International models only

ITEM #	DESCRIPTION	DIMENSIONS (W X D X H): IN (CM)	VOLTAGE	WATTS	AMPS	PLUG	CASE LOT
72000	Cayenne® Model 2000 Warmer only	14 x 22 x 9 (35.6 x 55.9 x 22.8)	120 AC	1000	8.3	5-15P	1
INTERNATIONAL MODEL							
72557	Cayenne® Model 2000 Warmer only	14 x 22 x 9 (35.6 x 55.9 x 22.8)	230 AC	1000	4.3	Schuko	1

SERVING SYSTEMS & COMPONENTS

CAYENNE® DROP-IN WARMER

- Thermoset Fiber-Reinforced Resin Well – self-insulating for maximum energy efficiency
- 6-foot cord and plug or hard wired
- Top mounts
- Low water indicator light eliminates guesswork
- Drain models allow for easy cleaning
- Recommend using up to 4" (10.2 cm) deep pans – full and fractional sizes

REFERENCE OUR SERVING SYSTEMS & COMPONENTS CATALOG FOR DROP-IN STYLES.

John BOOS Since 1887

ITEM #: _____ QTY: _____

MODEL #: _____

PROJECT NAME: _____

050719

3601 S. Banker St. Effingham, IL 62401 • P.O. BOX 609 • Ph: (888) 431-2667 • Fax: (800) 433-2667

"OS-E" 18GA - STAINLESS STEEL OVERSHELVES

FEATURES:

- 18 GAUGE, TYPE 300 STAINLESS STEEL W/ #4 POLISH, SATIN FINISH
- UPRIGHTS ARE 1-1/4" 18 GAUGE ROUND O.D. STAINLESS STEEL
- SQUARE TURNDOWN EDGE ON ALL FOUR SIDES
- SINGLE OVERSHELVES ARE MOUNTED 18" ABOVE TABLE TOP
- DOUBLE OVERSHELF ARE MOUNTED 18" ABOVE TABLE TOP W/ TOP SHELF 12" ABOVE MID SHELF
- MID SHELF OF DOUBLE SHELF UNITS ARE ADJUSTABLE
- NSF AND CSA CERTIFIED

CONSTRUCTION:

- STAINLESS STEEL OVERSHELVES ARE TIG WELDED
- EXPOSED WELDS ARE POLISHED TO MATCH ADJACENT SURFACES

MATERIAL:

- SHELF: 18 GAUGE TYPE 300 STAINLESS STEEL W/ #4 POLISH, SATIN FINISH
- UPRIGHTS: 1-1/4" ROUND O.D. 18 GAUGE TYPE 300 TUBULAR STAINLESS STEEL W/ #4 POLISH, SATIN FINISH

OS-ES-1248
(Does Not Include Table)

OS-ED-1248
(Does Not Include Table)

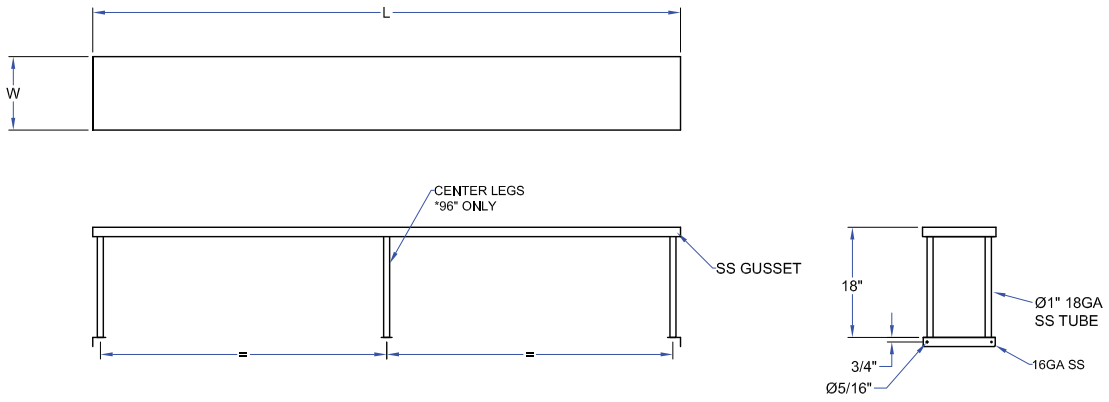
DOUBLE OVER SHELF WITH ADJUSTABLE MID SHELF

STAINLESS STEEL OVERSHELVES SINGLE SHELF		
SIZE (WXL)	MODEL	QTY
12" X 36"	OS-ES-1236	
12" X 48"	OS-ES-1248	
12" X 60"	OS-ES-1260	
12" X 72"	OS-ES-1272	
12" X 96"	OS-ES-1296	
18" X 36"	OS-ES-1836	
18" X 48"	OS-ES-1848	
18" X 60"	OS-ES-1860	
18" X 72"	OS-ES-1872	
18" X 96"	OS-ES-1896	

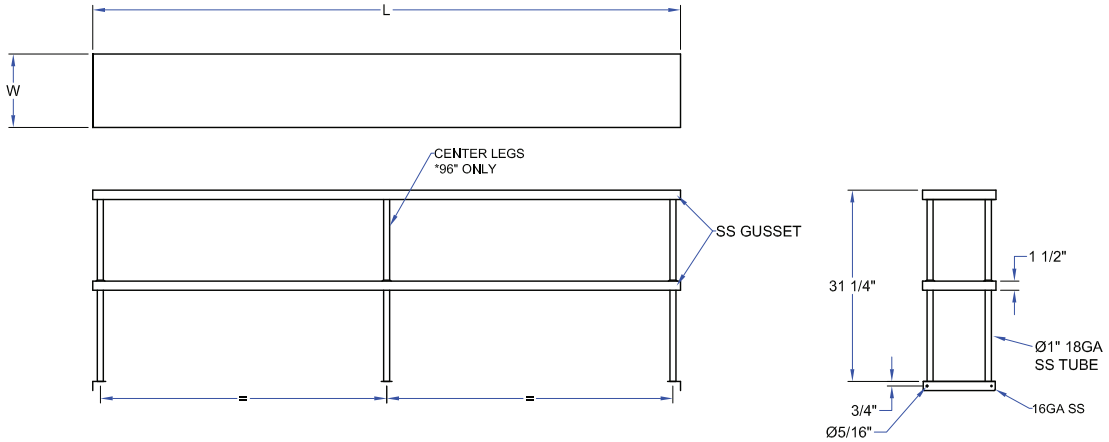
STAINLESS STEEL OVERSHELVES DOUBLE SHELF		
SIZE (WXL)	MODEL	QTY
12" X 36"	OS-ED-1236	
12" X 48"	OS-ED-1248	
12" X 60"	OS-ED-1260	
12" X 72"	OS-ED-1272	
12" X 96"	OS-ED-1296	
18" X 36"	OS-ED-1836	
18" X 48"	OS-ED-1848	
18" X 60"	OS-ED-1860	
18" X 72"	OS-ED-1872	
18" X 96"	OS-ED-1896	

DETAILED SPECIFICATIONS

SINGLE



DOUBLE



STAINLESS STEEL OVERSHELVES SINGLE SHELF

SIZE (WXL)	MODEL	WEIGHT (LBS)
12" X 36"	OS-ES-1236	15
12" X 48"	OS-ES-1248	17
12" X 60"	OS-ES-1260	21
12" X 72"	OS-ES-1272	24
12" X 96"	OS-ES-1296	40
18" X 36"	OS-ES-1836	23
18" X 48"	OS-ES-1848	24
18" X 60"	OS-ES-1860	29
18" X 72"	OS-ES-1872	34
18" X 96"	OS-ES-1896	56

STAINLESS STEEL OVERSHELVES DOUBLE SHELF

SIZE (WXL)	MODEL	WEIGHT (LBS)
12" X 36"	OS-ED-1236	24
12" X 48"	OS-ED-1248	31
12" X 60"	OS-ED-1260	36
12" X 72"	OS-ED-1272	40
12" X 96"	OS-ED-1296	56
18" X 36"	OS-ED-1836	33
18" X 48"	OS-ED-1848	43
18" X 60"	OS-ED-1860	50
18" X 72"	OS-ED-1872	56
18" X 96"	OS-ED-1896	68

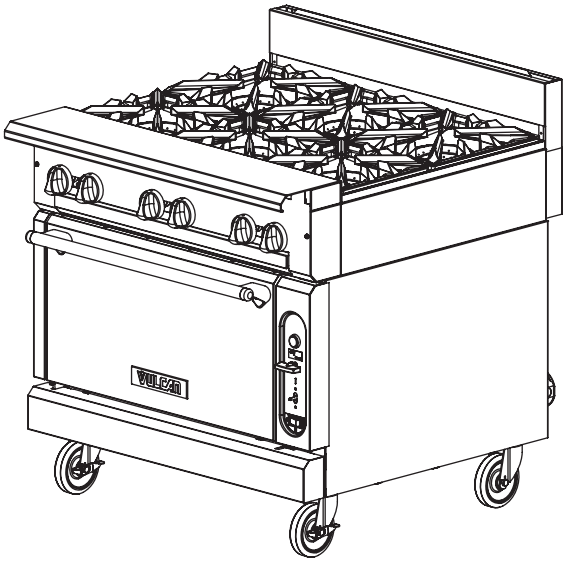
SOME UNITS SHIP UNASSEMBLED FOR REDUCED SHIPPING COST. ALL DIMENSIONS ARE TYPICAL. TOLERANCE +/- .500"

John Boos & Co. is constantly engaged in a program of improving products and therefore reserves the right to change specifications without prior notice.

Item # _____ C.S.I. Section 11420

HEAVY DUTY COOKING

HEAVY DUTY GAS RANGE
6-BURNER / 36" WIDE GAS RANGE



Model V6B36C
shown on a convection oven base

- ☐ **V6B36** 6-Burners / Modular
- ☐ **V6B36B** 6-Burners / Cabinet Base
- ☐ **V6B36S** 6-Burners / Standard Oven
- ☐ **V6B36C** 6-Burners / Convection Oven

STANDARD FEATURES

- Stainless steel front, front top ledge, burner box, sides, base, and stub back
- 1¼" diameter front gas manifold with 1¼" rear gas connection (capped)
- 35,000 BTU/hr. open top burners with lift off heads
- 50,000 BTU/hr. standard oven burner
- 32,000 BTU/hr. convection oven burner
- Porcelain oven cavity
- Individual pilots and controls for each burner
- Heavy-duty cast grates
- 4" stainless steel stub riser
- 6" adjustable stainless steel legs for “S”, “C”, and “B” models (no legs for modular model)
- Stainless steel cabinet base door
- Universal rack guides, one removable shelf (cabinet base)
- One year limited parts and labor warranty

OPTIONAL FEATURES (Factory Installed)

- ☐ Cap and cover front manifold
- ☐ Stainless steel oven cavity
- ☐ 650°F oven thermostat and steel hearth (“S” models)
- ☐ Fan cooling package (“C” models)
- ☐ 4" adjustable flanged feet for modular models
- ☐ Less legs for dolly mounting for “S”, “C”, and “B” models
- ☐ 3" high toe base for curb mounting
- ☐ Common condiment type, telescoping plate rails

ACCESSORIES (Packaged & Sold Separately)

- ☐ 1", or 1 ¼" gas pressure regulator (specify gas type – pack loose)
- ☐ Set of 4 casters, 6" high (two locking)
- ☐ 6" adjustable flanged feet for “S”, “C”, and “B” models
- ☐ Extra removable shelves for use with Universal rack guides (for cabinet base)
- ☐ “S” Grates
- ☐ Banking strip
- ☐ Common condiment type, telescoping plate rails (starting at 24" length)
- ☐ 10", 22", or 34" high back risers (no shelf)
- ☐ 22" single deck solid or flo-thru high shelf risers
- ☐ 34" double deck solid or flo-thru high shelf risers
- ☐ Dolly frames
- ☐ Flexible gas hose – quick disconnect & restraining device

SPECIFICATIONS

36" wide heavy duty gas range, Vulcan Model No. V6B36 (modular) and V6B36B (cabinet base) or V6B36S (standard oven base) and V6B36C (convection oven base). Modular construction for ease of installation. Stainless steel front, plate ledge, front top ledge with pull-out condiment rails, sides, base, stub back, and 6" adjustable legs on all “B”, “S”, & “C” models. Stainless steel extra deep crumb tray. Six 35,000 BTU/hr. cast burners with lift-off burner heads. Individual pilots and controls for each burner. Heavy duty cast burner grates, easy lift-off 11" x 12" in front, 14" x 12" in rear. Grates are separate from aeration bowl for ease of cleaning. **Standard Oven:** 50,000 BTU/hr. with porcelain oven bottom, sides and indoor panel. **Convection Oven:** 32,000 BTU/hr. with porcelain oven bottom, sides and interior door panel (115v-1 phase blower motor, 4 amps, 6' cord and plug). Oven measures 27"w x 27"d x 13"h. Standard oven thermostat adjusts from 150° – 550°F. Convection oven adjusts from 175° – 550°F and the optional finishing oven for standard ovens adjusts from 300° – 650°F. Standard oven supplied with one rack, convection oven with two racks. Both ovens allow for three rack positions. Oven door is heavy duty with counter weight door hinges. 1¼" diameter front gas manifold and 1¼" rear gas connection, capped. Total input 260,000 BTU/hr.

Exterior Dimensions:
36¾"d x 36"w x 36"h on 6" adjustable legs

VULCAN
a division of ITW Food Equipment Group LLC
P.O. Box 696 ■ Louisville, KY 40201 ■ Toll-free: 1-800-814-2028 ■ Local: 502-778-2791 ■ Quote & Order Fax: 1-800-444-0602

HEAVY DUTY COOKING

HEAVY DUTY GAS RANGE
6-BURNER / 36" WIDE GAS RANGE

INSTALLATION INSTRUCTIONS

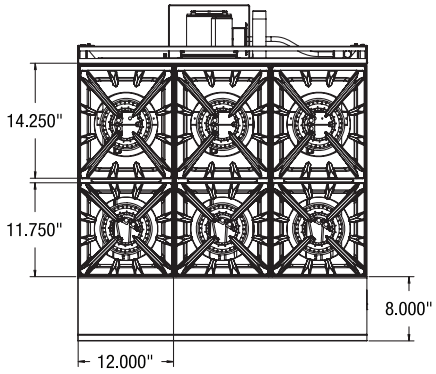
1. A properly sized gas pressure regulator suitable for battery or single unit application must be furnished and installed. Natural gas 6.0" W.C., propane gas 10.0" W.C.
2. An adequate ventilation system is required for commercial cooking equipment. Information may be obtained by writing to the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269, www.NFPA.org. When writing, refer to NFPA No. 96.
3. These units are manufactured for installation in accordance with ANSZ223.1A (latest edition), National Fuel Gas Code. Copies may be obtained from The American Gas Association, 400 N Capitol St. NW, Washington, DC 20001, www.AGA.org.
4. **Clearances**

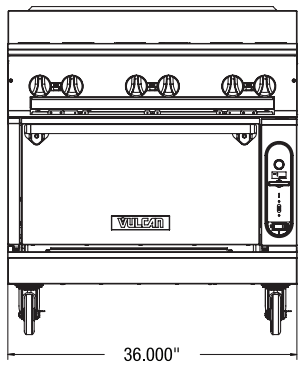
	Rear	Sides
Combustible	10"	10"
Non-combustible	0"	0"

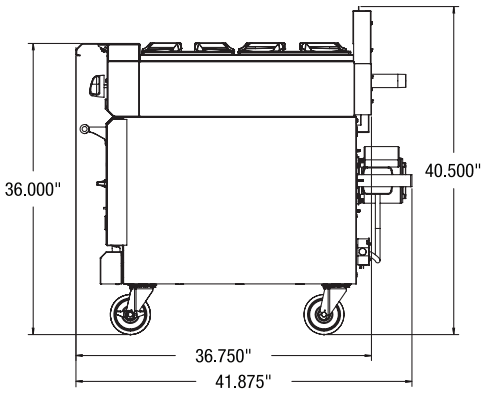
5. For proper combustion, install equipment on adjustable legs or casters. On curb or platform, allow 3½" front overhang. Toe base with leveling bolts are required for curb installation. Specify when ordering.
6. Cannot be batteried with GH series equipment.
7. This appliance is manufactured for commercial installation only and is not intended for home use.

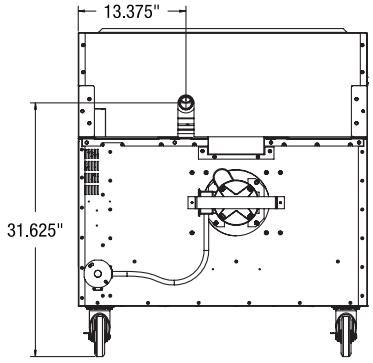
NOTE: In line with its policy to continually improve its product, Vulcan reserves the right to change materials and specifications without notice.

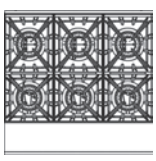
Specify type of gas when ordering.
Specify altitude when above 2,000 feet.









TOP CONFIGURATION	MODEL NUMBER	DESCRIPTION	TOTAL INPUT BTU / HR	SHIPPING WEIGHT LBS / KG
	**V6B36**	6-Burners / Modular	210,000	400 / 180
	V6B36B	6-Burners / Cabinet Base	210,000	435 / 196
	V6B36S	6-Burners / Standard Oven Base	260,000	690 / 311
	V6B36C	6-Burners / Convection Oven Base	242,000	730 / 329

This appliance is manufactured for commercial use only and is not intended for home use.

a division of ITW Food Equipment Group LLC
P.O. Box 696 ■ Louisville, KY 40201 ■ Toll-free: 1-800-814-2028 ■ Local: 502-778-2791 ■ Quote & Order Fax: 1-800-444-0602

John BOOS
Since 1887

ITEM #: _____ QTY: _____
MODEL #: _____
PROJECT NAME: _____

071017

3601 S. Banker St. Effingham, IL 62401 • P.O. BOX 609 • Ph: (888) 431-2667 • Fax: (800) 433-2667

"EPT6R10" STAINLESS STEEL PREP TABLE W/ SINK

- WITH 16GA STAINLESS STEEL WORK TOP
- WITH STAINLESS BASE & ADJUSTABLE UNDERSHELF

FEATURES:

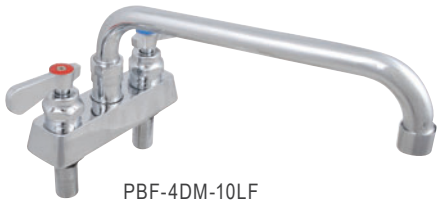
- 16 GAUGE STAINLESS STEEL TOP W/ 10" RISER & TURNDOWN
- TYPE 300 STAINLESS STEEL WITH # 4 POLISH, SATIN FINISH
- 1 1/2" STALLION EDGE ON FRONT WITH SIDE EDGES 90 DEGREE BEND DOWN FOR TABLE LINE-UP
- (1) 16" X 20" X 12" BOWL & (1) 16" X 20" X 4" BOWL
- (1) 18" X 22" X 5/8" POLY CUTTING BOARD
- STAINLESS STEEL UTENSIL DRAWER
- STAINLESS STEEL BASE WITH ADJUSTABLE UNDERSHELF
- ADJUSTABLE BULLET FEET
- SHIPPED KNOCKED-DOWN, EASY-TO-ASSEMBLE
- NSF CERTIFIED
- ** INCLUDES (1) DECK MOUNTED FACUET 4" O/C W/ 10" SWING SPOUT

ADJUSTABLE SHELF

L = LEFT BOWL
R = RIGHT BOWL

CONSTRUCTION:

- TOP: STAINLESS STEEL TOPS ARE TIG WELDED, EXPOSED WELDS ARE POLISHED TO MATCH ADJACENT SURFACE.



PBF-4DM-10LF

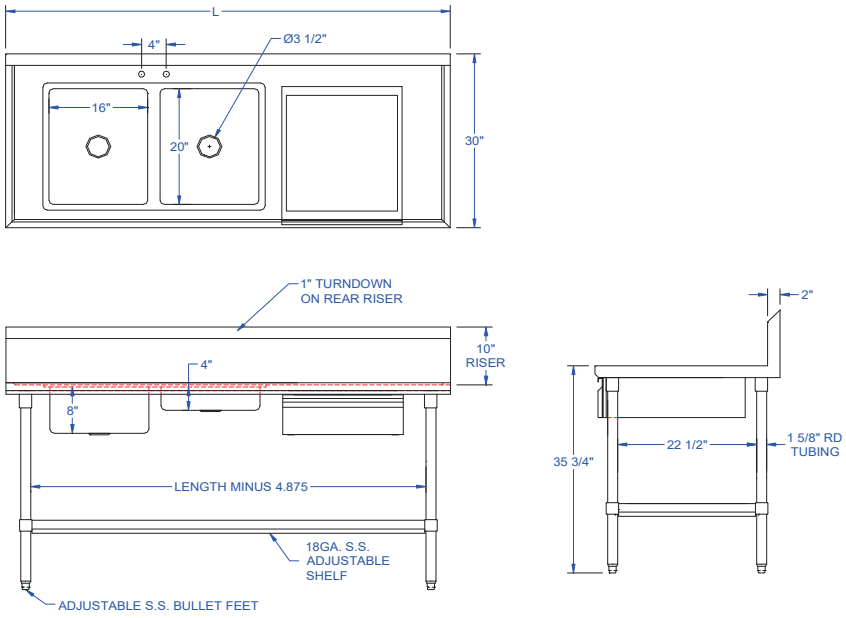
MATERIAL:

- TOP: 16 GAUGE STAINLESS STEEL TYPE 300 STAINLESS STEEL WITH # 4 POLISH, SATIN FINISH
- SHELF: 18 GAUGE STAINLESS STEEL,
- LEGS: 1 5/8" ROUND O.D. 16 GAUGE TUBULAR STAINLESS STEEL
- GUSSETS: STAINLESS STEEL
- FEET: 1" ADJUSTABLE STAINLESS STEEL BULLET FEET

STAINLESS STEEL PREP TABLE W/ SINK

30" WIDE	QTY
EPT6R10-DL2B-72L	
EPT6R10-DL2B-72R	
EPT6R10-DL2B-96L	
EPT6R10-DL2B-96R	

DETAILED SPECIFICATIONS



- ALL UNITS SHIP UNASSEMBLED FOR REDUCED SHIPPING COST.
- UNITS 7 FT. AND LARGER ARE FURNISHED WITH SIX LEGS.
- ALL DIMENSIONS ARE TYPICAL.
- TOLERANCE +/- .500".

- FINISHED SIZE OF UNDERSHELF.
  SHELF LENGTH = LENGTH MINUS 4.875"
  SHELF WIDTH = WIDTH MINUS 4.25"

STAINLESS STEEL PREP TABLE W/ SINK

LENGTH	30" WIDE	WT. (LBS)
72"	EPT6R10-DL2B-72L	328
72"	EPT6R10-DL2B-72R	328
96"	EPT6R10-DL2B-96L	360
96"	EPT6R10-DL2B-96R	360

MODEL # STRUCTURE

DL = DELUXE
10 = HT. OF RISER W/ TURNDOWN
R = RISER TOP WORK TABLE
6 = 16GA WORK SURFACE
EPT=ECONOMY PREP TABLE

2B = NUMBER OF BOWLS
72 = TABLE LENGTH
L = BOWL LOCATION

EPT6R10-DL2B-72L

SOME UNITS SHIP UNASSEMBLED FOR REDUCED SHIPPING COST. ALL DIMENSIONS ARE TYPICAL. TOLERANCE +/- .500"

3601 S. Banker St. • Effingham, IL 62401 • PO BOX 609 • quotes@johnboos.com
www.johnboos.com

TRUE MANUFACTURING CO., INC.
U.S.A. FOODSERVICE DIVISION
2001 East Terra Lane • O'Fallon, Missouri 63366-4434 • (636)240-2400
Fax (636)272-2408 • Toll Free (800)325-6152 • Intl Fax# (001)636-272-7546
Parts Dept. (800)424-TRUE • Parts Dept. Fax# (636)272-9471 • www.truemfg.com

Project Name: _____
Location: _____
Item #: _____ *Qty:* _____
Model #: _____

AIA #
SIS #

Model:
TUC-48-HC

Undercounter:
Solid Door Refrigerator with Hydrocarbon Refrigerant

TUC-48-HC

- True's undercounter units are designed with enduring quality that protects your long term investment.
- Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- High capacity, factory balanced refrigeration system that maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- All stainless steel front, top and ends. Matching aluminum finished back.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Front breathing.
- Heavy duty PVC coated wire shelves.
- Foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Cabinet Dimensions (inches) (mm) W	D†	H*	HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
TUC-48-HC	2	4	48⅜ 1229	30⅛ 766	29¾ 756	⅓ ¼	115/60/1 230-240/50/1	3.0 1.63	5-15P ▲	7 2.13	260 118

† Depth does not include 1" (26 mm) for rear bumpers.
* Height does not include 6¼" (159 mm) for castors or 6" (153 mm) for optional legs.

▲Plug type varies by country.

MADE WITH INNOVATION IN THE USA · 5 YEAR COMPRESSOR WARRANTY USA · ENERGY STAR · c UL us · CE · natural refrigerant

6/20 Printed in U.S.A.

APPROVALS:

AVAILABLE AT:

Model:
TUC-48-HC

Undercounter:
Solid Door Refrigerator with Hydrocarbon Refrigerant

STANDARD FEATURES

DESIGN
- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM
- Factory engineered, self-contained, capillary tube system using environmentally friendly R290 hydro carbon refrigerant that has zero (0) ozone depletion potential (ODP), & three (3) global warming potential (GWP).
- Oversized, factory balanced refrigeration system with guided airflow to provide uniform product temperatures.
- High capacity, factory balanced refrigeration system that maintains cabinet temperatures of 33°F to 38°F (.5°C to 3.3°C) for the best in food preservation.
- State of the art, electronically commutated evaporator and condenser fan motors. ECM motors operate at higher peak efficiencies and move a more consistent volume of air which produces less heat, reduces energy consumption and provides greater motor reliability.
- Condensing unit access in back of cabinet, slides out for easy maintenance.

CABINET CONSTRUCTION
- Exterior - stainless steel front, top and ends. Corrosion resistant GalFan coated steel back.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Insulation - entire cabinet structure and solid doors are foamed-in-place using a high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- 5" (127 mm) diameter stem castors - locks provided on front set. 36" (915 mm) work surface height.

DOORS
- Stainless steel exterior with clear aluminum liner to match cabinet interior.
- Each door fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Positive seal self-closing doors with 90° stay open feature. Doors swing within cabinet dimensions.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

SHELVING
- Four (4) adjustable, heavy duty PVC coated wire shelves 21 9/16"L x 16"D (548 mm x 407 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on ½" (13 mm) increments.

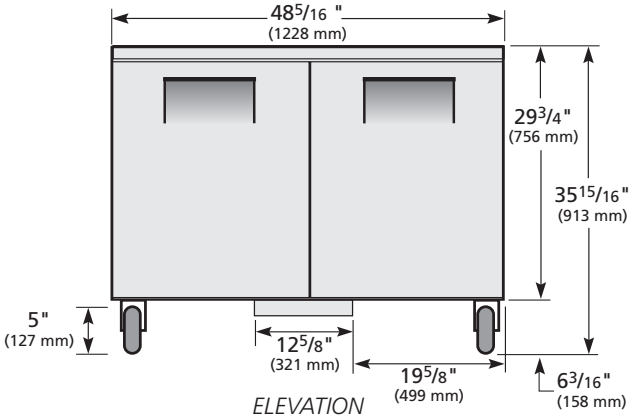
MODEL FEATURES
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- NSF/ANSI Standard 7 compliant for open food product.

ELECTRICAL
- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 15 amp dedicated outlet. Cord and plug set included.

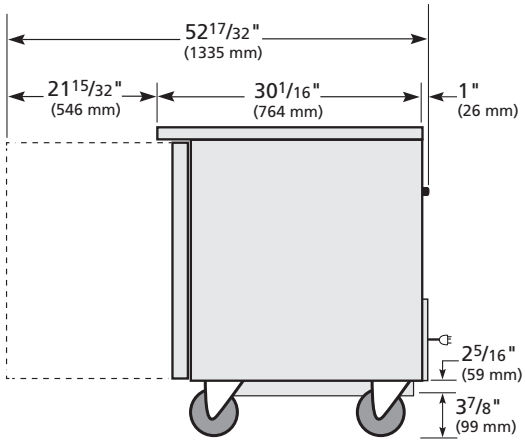
115/60/1
NEMA-5-15R

OPTIONAL FEATURES/ACCESSORIES
Upcharge and lead times may apply.
- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs.
- ❑ 6" (153 mm) seismic/flanged legs.
- ❑ 2½" (64 mm) diameter castors.
- ❑ Barrel locks (factory installed). Requires one per door.
- ❑ Single overshelf.
- ❑ Double overshelf.
- ❑ 30" (762 mm) deep, ½" (13 mm) thick, white polyethylene cutting board. Requires "L" brackets.
- ❑ 30" (762 mm) deep, ½" (13 mm) thick, composite cutting board. Requires "L" brackets.
- ❑ Heavy duty, 16 gauge tops.
- ❑ Exterior rectangular digital temperature display (factory installed).
- ❑ ADA compliant models with 34" (864 mm) work surface height.
- ❑ Low profile models with 31 7/8" (810 mm) work surface height.

PLAN VIEW



ELEVATION



RIGHT VIEW

3 YEAR PARTS + LABOR / 7 YEAR COMPRESSOR
WARRANTY
(U.S.A. only)

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Model	Elevation	Right	Plan	3D	Back
TUC-48-HC	TFQY02E	TFQY02S	TFQY02P	TFQY023	

TRUE MANUFACTURING CO., INC.
2001 East Terra Lane • O'Fallon, Missouri 63366-4434 • (636)240-2400 • Fax (636)272-2408 • Toll Free (800)325-6152 • Intl. Fax# (001)636-272-7546 • www.truemfg.com

STAINLESS STEEL

STANDARD HAND SINKS

Conforms To NSF 61/9 Lead Free Requirements

ADVANCE TABCO SMART FABRICATION™

SPLASH MOUNTED FAUCETS

7-PS-60

Wrist Handles

7-PS-68

7-PS-50

7-PS-54

DECK MOUNTED FAUCET

7-PS-67

7-PS-20

7-PS-20-NF
Faucet omitted

SINGLE HOLE PUNCH
Faucet omitted

7-PS-71

DOUBLE HOLE PUNCH
Faucet omitted

7-PS-70

LARGE SINK BOWLS

Features Large Size Sink Bowl 16” x 20” x 8”

7-PS-45

Features Large Size Sink Bowl 16” x 14” x 8”

7-PS-49

Item #: _____ **Qty #:** _____

Model #: _____

Project #: _____

FEATURES:

One piece **Deep Drawn** sink bowl design.

Sink bowl size is 10” x 14” x 5”.

7-PS-45 sink bowl size is 16” x 20” x 8”.

7-PS-49 sink bowl size is 16” x 14” x 8”.

All sink bowls have a large liberal radii with a minimum dimension of 2” and are rectangular in design for increased capacity.

Stainless steel 3 1/2” basket drain with 1-1/2” IPS.

Additional Features:

7-PS-20	4” O.C. deck mounted centerset faucet.
7-PS-20-NF	Deck mounted faucet omitted. Two 4” O.C. holes.
7-PS-45	4” O.C. splash mounted faucet and 2 Stainless Steel Support Brackets. (Hardware Included).
7-PS-49	4” O.C. splash mounted faucet and 2 Stainless Steel Support Brackets. (Hardware Included).
7-PS-50	4” O.C. splash mounted gooseneck faucet. Lever operated drain and built-in overflow with plastic overflow tube and spring clamps. 1-1/2” P-Trap.
7-PS-54	4” O.C. splash mounted gooseneck faucet. 1-1/2” P-Trap.
7-PS-60	4” O.C. splash mounted gooseneck faucet.
7-PS-67	4” O.C. splash mounted gooseneck faucet and lever operated drain.
7-PS-68	4” O.C. splash mounted gooseneck faucet with Wrist Handles.
7-PS-70	Splash mounted faucet omitted. Two 4” O.C. holes.
7-PS-71	Splash mounted faucet omitted. Single center hole.

CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

Die formed Countertop Edge with a No-Drip offset.

One sheet of stainless steel - No Seams.

MATERIAL:

Heavy gauge type 304 series stainless steel.

Wall mounting bracket is Galvanized and of offset design.

All fittings are brass / chrome plated unless otherwise indicated.

MECHANICAL:

Faucet supply is 1/2” IPS male thread hot and cold.

⚠WARNING:

Equipment that includes a faucet may expose you to chemicals, including lead, that are known to the State of California to cause cancer or birth defects or other reproductive harm. For more Info.,visit www.p65warnings.ca.gov.

ADVANCE TABCO SMART FABRICATION™
www.advancetabco.com

Customer Service Available To Assist You 1-800-645-3166 8:30 am - 7:00 pm E.S.T.

For Orders & Customer Service:
Email: customer@advancetabco.com or Fax: 631-242-6900

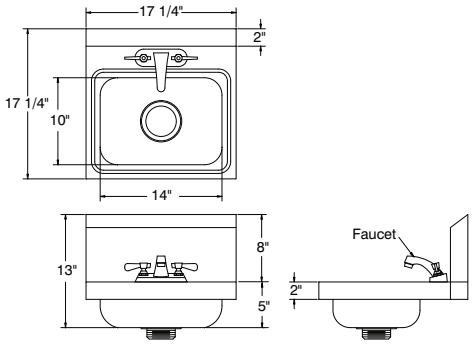
For Smart Fabrication™ Quotes:
Email: smartfab@advancetabco.com or Fax: 631-586-2933

REF-B

DIMENSIONS and SPECIFICATIONS

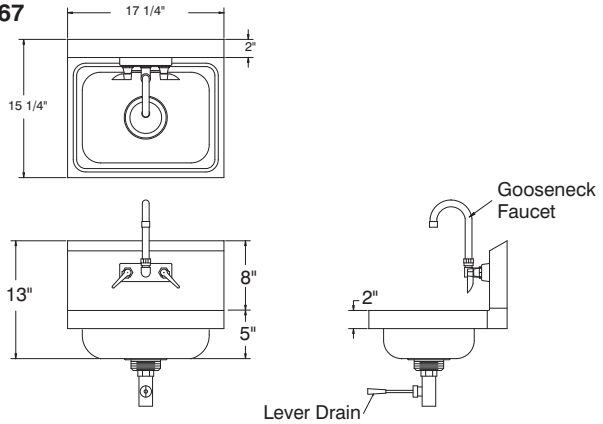
TOL Overall: ± .500" Interior: ± .250" **FITTINGS SUPPLIED AS SHOWN** **ALL DIMENSIONS ARE TYPICAL**

7-PS-20



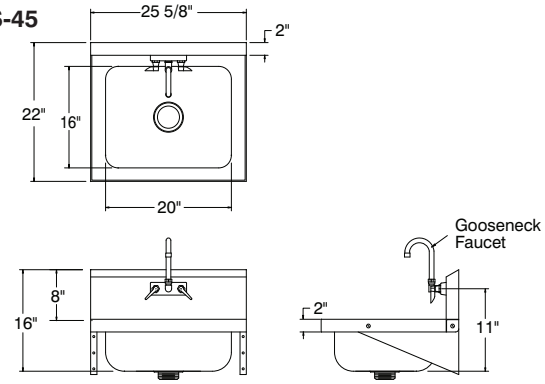
15 lbs.

7-PS-67



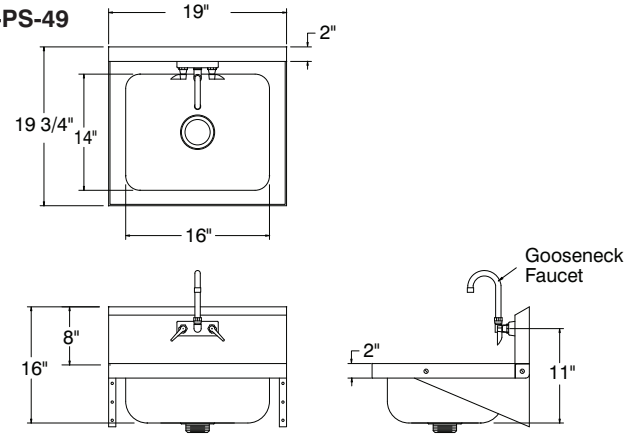
15 lbs.

7-PS-45



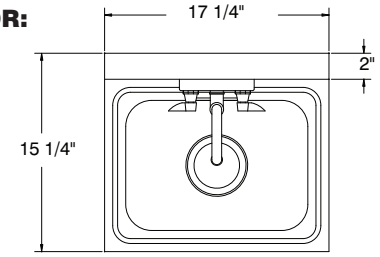
31 lbs.

7-PS-49



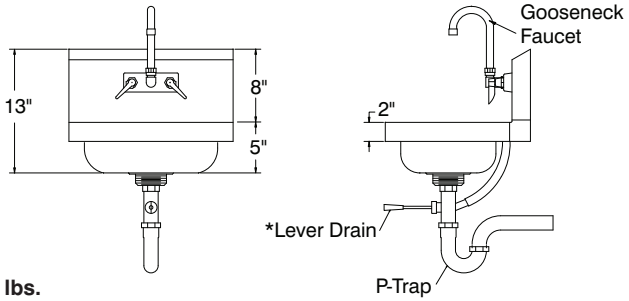
31 lbs.

TOP VIEW FOR:
7-PS-50
7-PS-54
7-PS-60
7-PS-68
7-PS-70



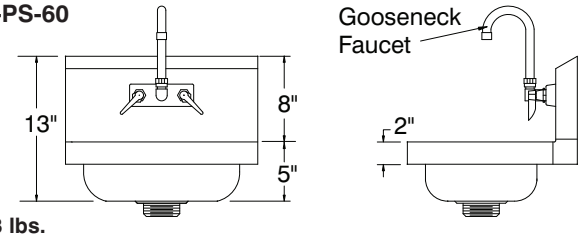
Sink Bowl 10" x 14" x 5"

7-PS-50 & 7-PS-54*
NOTE: *7-PS-54 Hand Sink <u>Excludes</u> Lever Drain and Overflow



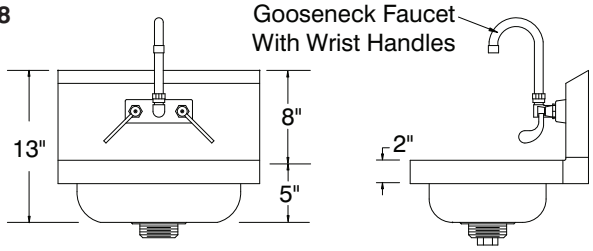
15 lbs.

7-PS-60



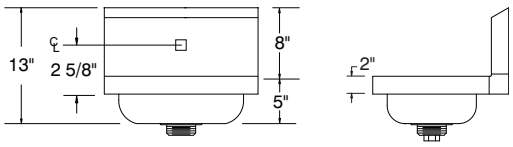
13 lbs.

7-PS-68

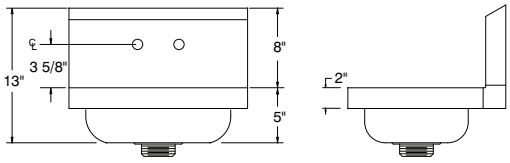


13 lbs.

7-PS-71



7-PS-70



12 lbs.

ADVANCE TABCO
SMART FABRICATION™

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

Item # _____ C.S.I. Section 11420

HEATED HOLDING

VHFA18
18 PAN NON-INSULATED CABINET

Model VHFA18

SPECIFICATIONS

Eighteen level holding and transport cabinet, Vulcan Model No. VHFA18. Heavy duty 20 gauge polished stainless steel cabinet. Four 5" casters, 2 swivel with brakes, 2 rigid. Glass door with heavy duty hinges, door latch mechanism, and gaskets. Interior pan supports are designed to accommodate pan covers for transporting, and are removable for easy cleaning. Accepts eighteen 18" x 26" pans or thirty-six 12" x 20" x 2¾" pans. Top mounted, control panel includes power “on” and heater “on” indicator lights, dial thermostat adjusts from ambient to 190°F, and temperature read-out dial. Two 1,000 watt metal sheathed heating elements, 16.7 amps total draw. One year limited parts and labor warranty. After the first year, 10-year parts warranty on the heating elements. Requires 120 volt, single phase power supply. Furnished with top mounted 8 foot power cord with strain relief and NEMA 5-20 plug.

Exterior Dimensions:
25¼"w x 30¾"d x 71"h

UL Listed. Classified by UL to NSF Std. #4.

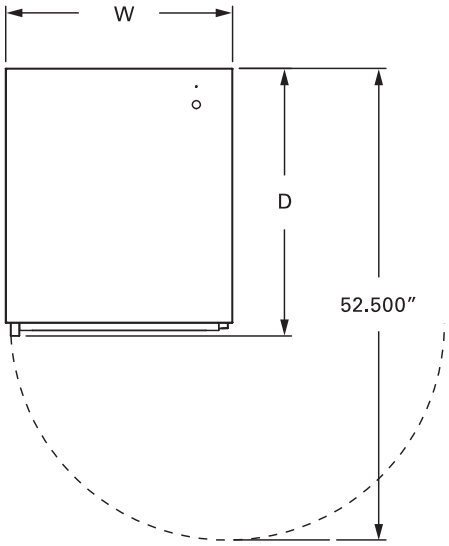
STANDARD FEATURES

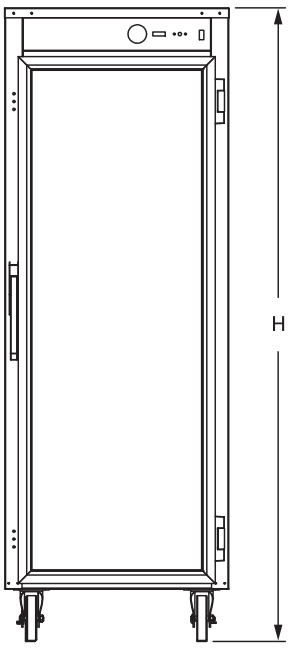
- Eighteen level holding and transport cabinet accepts eighteen 18" x 26" pans or thirty-six 12" x 20" pans, pans may be up to 2¾" tall.
- Heavy duty 20 gauge polished stainless steel cabinet.
- Set of 5" casters, two swivel with brakes and two rigid.
- Full size glass door with field reversible heavy duty hinges, door latch mechanism, and gaskets.
- Fixed interior pan supports are designed to accommodate pan covers for transporting, and are removable for easy cleaning.
- Top mounted, control panel includes power “on” and heater “on” indicator lights, dial thermostat adjustable from ambient to 190°F, and temperature read-out dial.
- Top mounted control panel is easy to use and out of the way of brooms, mops, and feet when transporting. Control panel on top eliminates removing control panel for cleaning.
- Fan and air tunnel provide even heat distribution.
- Two 1,000 watt metal sheathed heating elements, 16.7 amps total draw.
- Requires 120 volt, single phase power supply.
- Furnished with top mounted 8 foot power cord with strain relief and NEMA 5-20 plug (except for Canada which comes with a 5-30 plug).
- One year limited parts and labor warranty. After the first year, 10-year parts warranty on the heating elements.

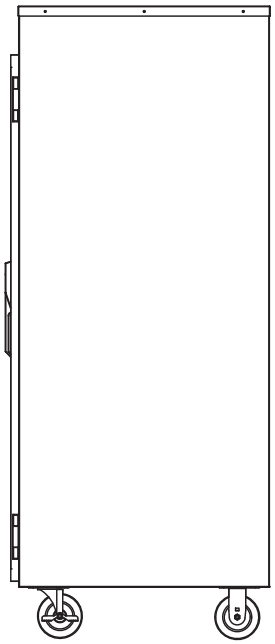
a division of ITW Food Equipment Group LLC
P.O. Box 696 ■ Louisville, KY 40201 ■ Toll-free: 1-800-814-2028 ■ Local: 502-778-2791 ■ Quote & Order Fax: 1-800-444-0602

HEATED HOLDING

VHFA18
18 PAN NON-INSULATED CABINET







Model Number	Pan Capacity		Exterior Dimensions			Electrical Specifications			Shipping Weight lbs / kg
	18" x 26"	12" x 20"	Width	Depth	Height	Volts	Watts	Amps	
VHFA18	18	36	25¼"	30¾"	71"	120	2,000	16.7	220 / 100

VULCAN
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P.O. Box 696 ■ Louisville, KY 40201 ■ Toll-free: 1-800-814-2028 ■ Local: 502-778-2791 ■ Quote & Order Fax: 1-800-444-0602

AIA File No.

Item No. _____

Quantity _____

NEMCO®

FOOD EQUIPMENT

Model No.

8018-BW, 8027-BW, 8036-BW, 8045N-BW, 8045W-BW, 8075-BW

MOIST HEAT BUN/FOOD WARMERS

8024-BW, 8048-BW

BUN/FOOD WARMERS

8018-SBB, 8027-SBB, 8036-SBB, 8045W-SBB, 8045N-SBB, 8075-SBB, 8230-SBB, 8250-SBB, 8027-BWNH

STAINLESS STEEL BUN BOXES

8027-BW

8024-BW

8048-BW

8045W-SBB

NSF

ETL LISTED c US

Intertek

MOIST HEAT BUN/FOOD WARMERS

Keep your buns fresh and tasty with Nemco's line of moist heat bun / food warmers! This unit will warm it, store it and sell it! They're great for holding buns or even buns with hotdogs. And they're manufactured to the high quality you are used to from Nemco! With several different sizes designed to fit beneath the Nemco Roller grill models, they make a very profitable addition to your operation.

Standard Features:

- Stainless steel construction
- Stainless steel rack in bottom of pan to separate buns from water
- Adjustable thermostat up to 200˚F
- Easy open sliding drawer
- Fits under Roller Grill to maximize counter space

BUN / FOOD WARMERS

Whether you need capacity for two or four dozen buns, these durable, stainless steel, single-drawer warmers **without a water reservoir** will keep the buns and other foods fresh and ready to serve. Their space-saving, stackable design makes for an easy fit anywhere. 8024-BW has a stainless steel flip door.

Standard Features:

- Stainless steel construction
- Temperature of the **8024-BW reaches 100˚F** and 8048-BW reaches 150˚F
- Fits under Roller Grill to maximize counter space

STAINLESS STEEL BUN BOXES

Each of these commercial-grade boxes provides a durable, stackable storage unit that keeps your hot dog buns fresh (leave buns in bag). They are designed to accommodate the appropriate size roller grill for maximum countertop efficiency.

Standard Features:

- Stainless steel construction
- Polycarbonate hinged doors
- Fits under Roller Grill to maximize counter space

NEMCO Food Equipment, Ltd.
301 Meuse Argonne Ave.
Hicksville, OH 43526
Phone (419) 542-7751
FAX (419) 542-6690
www.nemcofoodequip.com

Printed 11/11 Printed in U.S.A.

Model No.

8018-BW 8027-BW 8036-BW 8045W-BW 8045N-BW 8075-BW
8024-BW 8048-BW
8018-SBB 8027-SBB 8036-SBB 8045W-SBB 8045N-SBB 8075-BW 8230-SBB 8250-SBB 8027-BWNH

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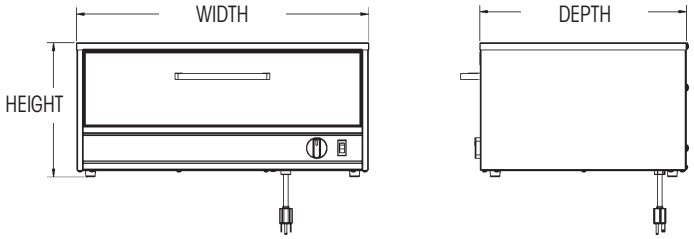

Specifications - Moist Heat Bun/Food Warmers

Model No.	Fits Grill Model	Bun Capacity	Preheat Time	Width Inches/(cm)	Depth Inches/(cm)	Height Inches/(cm)	Volts	Rated Wattage	Nominal Amps	NEMA Plug	Actual Weight lbs./(kg)	Shipping Weight lbs./(kg)
8018-BW 8018-BW-220	8018	24	15	18 1/2″ (47.0)	17 1/2″ (44.5)	10 5/8″ (27.0)	120 220	400 400	3.3 1.8	5-15 P 6-15 P	37 (16.8)	45 (20.5)
8027-BW 8027-BW-220	8027	32	15	23 3/4″ (60.3)	17 3/4″ (45.1)	10 5/8″ (27.0)	120 220	450 450	3.8 2.0	5-15 P 6-15 P	45 (20.5)	52 (23.7)
8036-BW 8036-BW-220	8036	48	15	30″ (76.2)	17 1/2″ (44.5)	10 5/8″ (27.0)	120 220	550 550	4.6 2.5	5-15 P 6-15 P	56 (25.5)	64 (29.0)
8045W-BW 8045W-BW-220	8045W	64	15	35 1/2″ (90.2)	17 1/2″ (44.5)	10 5/8″ (27.0)	120 220	650 650	5.4 3.0	5-15 P 6-15 P	63 (29.7)	72 (32.8)
8045N-BW 8045N-BW-220	8045N	32	15	23 3/4″ (60.3)	26 3/4″ (67.9)	10 5/8″ (27.0)	120 220	450 450	3.8 2.0	5-15 P 6-15 P	49 (22.3)	60 (27.3)
8075-BW 8075-BW-220	8075	64	15	35 1/2″ (90.2)	25 (63.5)	10 5/8″ (27.0)	120 220	650 650	5.4 3.0	5-15 P 6-15 P	71 (32.3)	84 (38.2)

Specifications - Bun/Food Warmers

Model No.	Fits Grill Model	Bun Capacity	Preheat Time	Width Inches/(cm)	Depth Inches/(cm)	Height Inches/(cm)	Volts	Rated Wattage	Nominal Amps	NEMA Plug	Actual Weight lbs./(kg)	Shipping Weight lbs./(kg)
8024-BW 8024-BW-220	8010	24	30	15 3/4″ (40.0)	11″ (27.9)	5″ (12.7)	120 220	20	0.17 0.09	5-15 P 6-15 P	9 (4.1)	11 (5.0)
8048-BW 8048-BW-220	8027	48	30	22″ (55.9)	15 1/4″ (38.7)	7 1/2″ (19.1)	120 220	108	0.9 0.5	5-15 P 6-15 P	27.5 (12.5)	33 (15.0)

Specifications - Bun Boxes

Model No.	Fits Grill Model	Bun Capacity	Width Inches/(cm)	Depth Inches/(cm)	Height Inches/(cm)	Actual Weight lbs./(kg)	Shipping Weight lbs./(kg)
8018-SBB	8018	36	18 3/4″ (47.6)	19″ (48.3)	6 1/4″ (15.9)	9 (4.1)	12 (5.4)
8027-SBB	8027	36	22 3/4″ (57.8)	19″ (48.3)	6 1/4″ (15.9)	14 (6.4)	19 (8.7)
8036-SBB	8036	48	29 5/8″ (75.2)	19″ (48.3)	6 1/4″ (15.9)	15 (6.9)	20 (9.1)
8045W-SBB	8045W	60	35 1/2″ (90.2)	19″ (48.3)	6 1/4″ (15.9)	17 (7.8)	23 (10.5)
8045N-SBB	8045N	64	22 1/4″ (56.5)	28 1/4″ (71.8)	6 1/4″ (15.9)	15 (6.9)	20 (9.1)
8075-SBB	8075	96	35 1/2″ (90.2)	28 1/4″ (71.8)	6 1/4″ (15.9)	18 (8.2)	26 (11.9)
8230-SBB	8230	36	23 3/4″ (60.3)	21 1/4″ (71.8)	6 1/4″ (15.9)	15 (6.9)	20 (9.1)
8250-SBB	8250	60	35 3/4″ (90.8)	21 1/4″ (71.8)	6 1/4″ (15.9)	17 (7.8)	23 (10.5)
8027-BWNH	8027	32	23 3/4″ (60.3)	17 3/4″ (44.5)	10 5/8″ (27.0)	45 (20.5)	52 (23.7)

Typical Specifications

Moist heat bun/food warmers shall have stainless steel body, interior, bun drawer slides and pan and be equipped with a thermostatic control and metal sheath heating element. They also shall have a maximum heat setting of 200˚F and shall operate on 120V and 220V. The bun/food warmers model # 8024-BW shall have a maximum heat setting of 100˚F and the 8048-BW unit shall have a maximum heat setting 150˚F. A 6' cord and plug shall be furnished for easy installation on all Moist Heat Bun/Food Warmers and Bun/Food Warmers. Moist heat bun/food warmers shall be ETL and National Sanitation Foundation listed. The Bun/Food Warmers shall be ETL and National Sanitation Foundation listed. The Bun Boxes shall be National Sanitation Foundation listed.

NEMCO Food Equipment, Ltd.
301 Meuse Argonne Ave.
Hicksville, OH 43526
Phone 419-542-7751
FAX 419-542-6690

www.nemcofoodequip.com

Item No. _____

Quantity _____

AIA File No. _____

NEMCO®
FOOD EQUIPMENT

Model Nos. 8010, 8010V, 8018, 8027, 8036, 8045N, 8045W, 8075, *GripsIt* 8010SX, 8010VSX, 8018SX, 8027SX, 8036SX, 8045SXN, 8045SXW, 8075SX

Hot Dog Roller Grills

8027

When it comes to making money, you can't go wrong with an original. Operators will tell you Nemco—the original hot dog roller grill—has always been famous for its superior diehard cooking performance. Its time-tested, maintenance-free design will serve you for years and forever satisfy your customers with the tastiest, juiciest hot dogs. 360° roller rotation prevents residue buildup, while individual roller heating elements ensure heating consistency. Removable drip pan makes for easy cleaning. Requires no ventilation system. Seven heat settings offer versatile temperature control. Front and rear rollers have their own heat controls. This feature permits shutting off one section during non peak hours. *GripsIt*—this coating makes clean up easy for those sugary-coated products and breakfast items.

Standard Features:

- Rugged stainless steel and aluminum construction
- Simplest installation– plugs into any outlet with corresponding voltage
- Rollers available in either standard chrome, or *GripsIt* which cleans easily with just a damp sponge
- Two individual heat controls for front and rear rollers except 8010 series
- Temperature control with seven heat settings
- Individual heating element in each roller with superior temperature consistency from end to end
- Sealed motor with ball bearings to prevent grease leakage out of motor
- Rollers rotate at a complete 360° turn by means of a roller sprocket, motor sprocket and chain
- End bearing and grease barrier double protect against grease seepage
- Removable grease drip pan
- Preheat time is 10 minutes
- Full one year factory warranty
- NSF and cETLus certified

Accessories:

- Food Safety Guards available for all roller grills; offers sanitary protection
- Heated and humidified Bun Warmers keep buns fresh and ready to serve
- Bun boxes come in a variety of sizes for great merchandising
- Stainless steel Condiment Bars and Stations provide a neat and efficient way to provide condiments

NEMCO Food Equipment, Ltd.
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Phone (419) 542-7751
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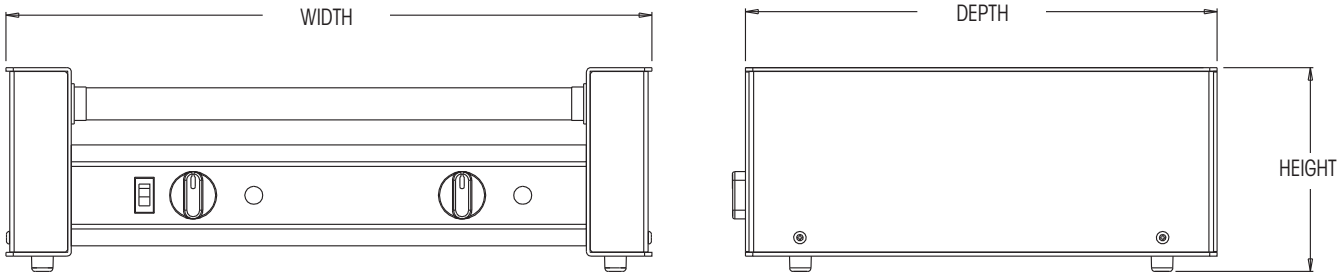
www.nemcofoodequip.com

Printed 6/14 Printed in U.S.A.

AIA File No.

Model Nos.

Chrome	8010	8010V	8018	8027	8036	8045N	8045W	8075
GripsIt	8010SX	8010VSX	8018SX	8027SX	8036SX	8045SXN	8045SXW	8075SX



Specifications:

Model No.	Hot Dog Capacity	Width Inches/(cm)	Depth Inches/(cm)	Height Inches/(cm)	Voltage	Wattage	Nominal Amps	# of Cords/ NEMA Configuration	Unit Weight lbs./(kg)	Shipping Weight lbs./(kg)
8010, 8010SX 8010-220, 8010SX-220 8010-230, 8010SX-230	10	16 (40.6)	11 (27.9)	7 1/4 (18.4)	120 220 230	330 330 330	2.8 1.5 1.4	(1) 5-15 plug (1) 6-15 plug (1) SCHUKO	18 (8.2)	20 (9.1)
8018, 8018SX 8018-220, 8018SX-220 8018-230, 8018SX-230	18	18 1/2 (47.0)	16 1/4 (41.3)	7 (17.8)	120 220 230	950 950 950	7.9 4.3 4.1	(1) 5-15 plug (1) 6-15 plug (1) SCHUKO	29 (13.2)	35 (16.0)
8027, 8027SX 8027-220, 8027SX-220 8027-230, 8027SX-230	27	22 1/4 (56.5)	16 1/4 (41.3)	7 (17.8)	120 220 230	950 950 950	7.9 4.3 4.1	(1) 5-15 plug (1) 6-15 plug (1) SCHUKO	33 (15.0)	38 (17.3)
8036, 8036SX 8036-220, 8036SX-220 8036-230, 8036SX-230	36	29 1/2 (74.9)	16 1/4 (41.3)	7 (17.8)	120 220 230	1500 1500 1500	12.5 6.8 6.5	(1) 5-15 plug (1) 6-15 plug (1) SCHUKO	44 (20.0)	50 (22.8)
8045N, 8045SXN 8045N-220, 8045SXN-220 8045N-230, 8045SXN-230	45	22 1/4 (56.5)	25 3/4 (65.4)	7 (17.8)	120 220 230	1520 1520 1520	12.7 6.9 6.6	(1) 5-15 plug (1) 6-15 plug (1) SCHUKO	52 (23.7)	58 (26.4)
8045W, 8045SXW 8045W-220, 8045SXW-220 8045W-230, 8045SXW-230	45	35 1/2 (90.2)	16 1/4 (41.3)	7 (17.8)	120 220 230	1800 1800 1800	15.0 8.2 7.9	(1) 5-15 plug (1) 6-15 plug (1) SCHUKO	51 (23.2)	57 (26.0)
8075, 8075SX 8075-220, 8075SX-220 8075-230, 8075SX-230	75	35 1/2 (90.2)	25 3/4 (65.5)	7 (17.8)	120 220 230	2880 2880 2880	24.0 13.1 12.5	(2) 5-15 plug (2) 6-15 plug (2) SCHUKO	75 (34.1)	83 (37.8)

(SX) Denotes special non slip *GripsIt* coating

Typical Specifications

Roller Grill shall be stainless steel and heavy-duty aluminum construction and use a special non slip *GripsIt*, or chrome rollers and tubular heating elements. One element shall be contained in each roller. Seven setting infinite temperature control provides flexible cooking and holding. Unit shall have a sealed motor with ball bearings for long life. Each roller shall have a PTFE end bearing and FEP grease barrier combination. The unit shall be equipped with a pilot light, lighted rocker switch and operate on 120V (60Hz) with (1) or (2) 6' cord (s) and NEMA 5-15P, 5/20P, on 220V (60Hz) with a 6' cord and NEMA 6-15P, or on 230V (50Hz) with a 6' cord and SCHUKO CEE7-7. Roller grills shall carry the approval of cETLus (120V, 220V), shall be listed with the National Sanitation Foundation (120V), and shall carry the approval of CE (230V).

NEMCO FOOD EQUIPMENT

NEMCO Food Equipment, Ltd.
301 Meuse Argonne
PO Box 305
Hicksville, OH 43526
Phone (419) 542-7751
Fax (419) 541-6690
www.nemcofoodequip.com

Project _____

Item # _____

Quantity _____

Macho Nacho® Chip Warmers

Models: FDWD-1-MN,
FST-1-MN

The Hatco Macho Nacho® Holding and Display Cabinet is a high-visibility merchandiser for warming and displaying nacho chips. These heated displays use no humidity, and keep chips hot, fresh and crisp considerably longer than other warmers, reducing refill time and minimizing waste. The FDWD-1-MN holds up to 25 lbs. (11 kg) and the FST-1-MN holds up to 40 lbs. (18 kg)

The unique air flow forces warm air to the bottom and is distributed into the cabinet through holes in the floor panels, directing maximum heat to the chips being served. Macho Nacho® circulates air to prevent the loss of natural oils, eliminating the need to frequently replace stale chips.

FST-1-MN with standard bronze finish

FDWD-1-MN

Standard features

- Two-door access permits easy loading and serving. Chips flow to the front of the cabinet when loading through the upper door and the heated, slanted floor panel slides the hot chips to the lower door for serving
- Built of stainless steel and aluminum with tempered glass sides and doors with chip slide and floor panels that are removable for ease of cleaning
- Shatter-resistant incandescent lights enhance food appeal while safeguarding food products from bulb breakage
- Snappy graphic decals for three sides help promote product
- Anodized bronze finish is standard on the FST model

Options (available at time of purchase only)

Color for FST model only
Non-standard colors are non-returnable – Bronze Finish standard
☐ Clear Anodized Finish

For operation, location and safety information, please refer to the Installation and Operating Manual.

ANSI/NSF 4

MADE IN THE USA

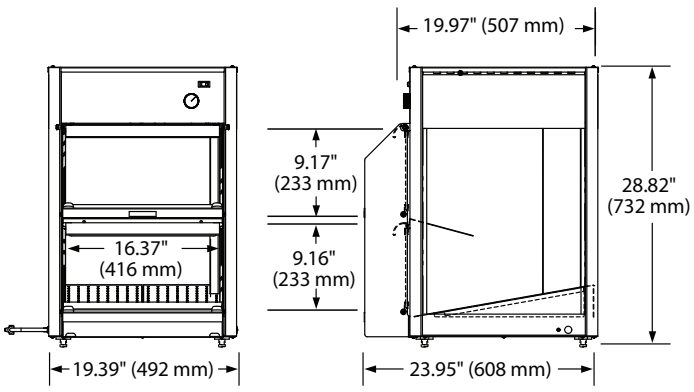
HATCO CORPORATION | P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. | (800) 558-0607 | (414) 671-6350

www.hatcocorp.com | support@hatcocorp.com | Find a Hatco Rep | Image Library | Document Library | Chat

Macho Nacho® Chip Warmers

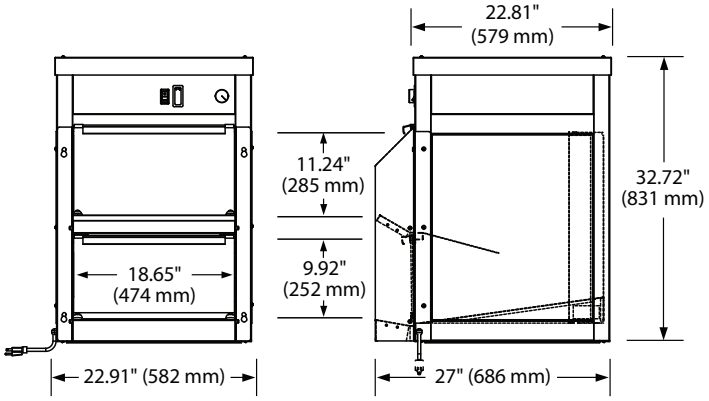
Models: FDWD-1-MN, FST-1-MN

FDWD-1-MN



FRONT VIEW SIDE VIEW

FST-1-MN



FRONT VIEW SIDE VIEW

SPECIFICATIONS
Chip Warmers - Non-Humidified

The shaded areas contain electrical information for International models

Model	Description	Dimensions (W x D x H)	Cabinet Opening (W x H)	Volts	Watts	Amps	Plug	Ship Weight*
FDWD-1-MN	2 Doors	19.39" x 23.95" x 28.82" (492 x 608 x 732 mm)	Upper Door: 16.37" x 9.17" (416 x 233 mm) Lower Door: 16.37" x 9.16" (416 x 233 mm)	120	1080	9.0	NEMA 5-15P	101 lbs. (46 kg)
				220	950	4.3	CEE 7/7 Schuko	
				240	1129	4.7	BS-1363	
FST-1-MN	2 Doors	22.91" x 27" x 32.72" (582 x 686 x 831 mm)	Upper Door: 18.65" x 11.24" (474 x 285 mm) Lower Door: 18.65" x 9.92" (474 x 252 mm)	120	1245	10.4	NEMA 5-15P	132 lbs. (60 kg)
				220	1219	5.6	CEE 7/7 Schuko, AS 3112	
				240	1252	5.2	AS 3112, BS-1363	

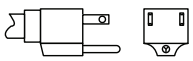
* Shipping weight includes packaging.

CORD LOCATION

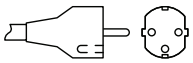
Facing controls, left-hand side panel, bottom right corner.

PLUG CONFIGURATIONS

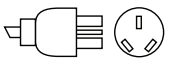
NEMA 5-15P



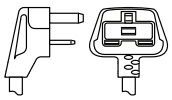
CEE 7/7 Schuko



AS 3112



BS-1363



PRODUCT SPECS
Chip Warmers

The Holding and Display Cabinet shall be a Flav-R-Fresh® (or Flav-R-Savor®) Macho Nacho® Model ... as manufactured by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The Chip Warmer Cabinet shall be rated at ... volts and ... watts and be ... inches (millimeters) in overall width.

It shall consist of two doors, tempered glass sides and doors, incandescent display lights, and merchandising graphics. A 6' (1829 mm) cord with plug shall be attached.

Warranty consists of 24/7 parts and service assistance (US and Canada only).

Job _____ Item No. _____

Heated Peristaltic Condiment Dispenser

Standard Dispenser ☐HPDE1 ☐HPDE2
Standard Dispenser with Portion Control ☐HPDE1P ☐HPDE2P
High Performance Dispenser ☐HPDE1H ☐HPDE2H
High Performance Dispenser with Portion Control ☐HPDE1HP ☐HPDE2HP

HPDE1
[nacho cheese is not included]

DESCRIPTION

Star peristaltic dispensers use a patented heating and pumping system designed for safe, efficient dispensing of cheese and other pouched condiments. These units are designed to operate consistently, quietly, and at a cool external temperature. Optional portion control delivery system allows for accurate and repeatable delivery of cheese and other pouched condiments.

SPECIFICATIONS

Star peristaltic dispensers will be constructed with stainless steel supports and high impact plastic panels. Dispensers will use a patented forced air heating system and patented pump design. The optional portion control delivery system will provide a consistent volume of product up to 2.5 oz. (74 ml) per cycle. Dispensers will use an adjustable, digital temperature control, but will be preset from the factory at 145°F (63°C). Units will feature a removable stainless steel drip pan. Units will come with a factory attached six [6] foot cord and an appropriate plug based on the units power requirements.

WARRANTY

These units come with a one [1] year warranty for parts and labor.

FEATURES

- Patented pump design evacuates cheese and condiments directly from the pouch with at least 95% evacuation of product.
- Designed to use one 6 lb. (2.72 kg) pouch and hold another for preheating on HPDE1 models and two 6 lb. (2.72 kg) pouches and hold another two for preheating on HPDE2 models
- Optional portion control system uses pressure sensitive switch[s] to deliver approximately 0.75 oz. (22 ml) of product every second, with up to 2.5 oz. (74 ml) delivered per cycle
- Patented forced air heating system provides precise, uniform temperature
- Adjustable digital temperature control allows for consistent but flexible operation
- Low profile, 27.1-inch (688 mm) tall design for convenient placement even in tight kitchens

OPTIONS & ACCESSORIES

- Portion control system
- High performance dispenser

CERTIFICATIONS

MADE IN THE USA

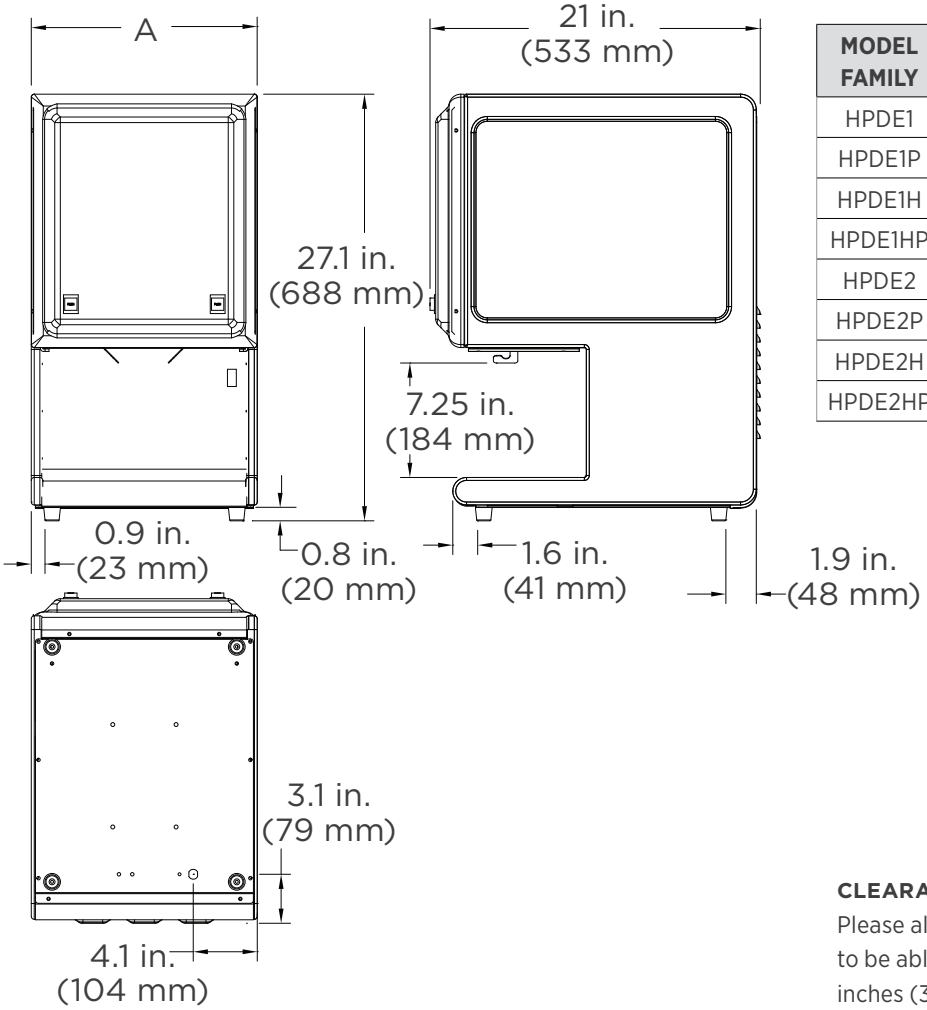
STAR MANUFACTURING INTERNATIONAL INC.
265 Hobson Street • Smithville, Tennessee 37166
Telephone 800 264 7827 • Fax 314 781 5445
www.star-mfg.com

Printed in the U.S.A. • 2M-Z21753 • Rev - • 11.2016

Heated Peristaltic Condiment Dispenser

Standard Dispenser ☐**HPDE1** ☐**HPDE2**
Standard Dispenser with Portion Control ☐**HPDE1P** ☐**HPDE2P**
High Performance Dispenser ☐**HPDE1H** ☐**HPDE2H**
High Performance Dispenser with Portion Control ☐**HPDE1HP** ☐**HPDE2HP**

HPDE2 shown



MODEL FAMILY	MOTOR SPEED	6 lb. POUCHES USED/HELD IN RESERVE
HPDE1	75 rpm	one/two
HPDE1P	75 rpm	one/two
HPDE1H	165 rpm	one/two
HPDE1HP	165 rpm	one/two
HPDE2	75 rpm	two/four
HPDE2P	75 rpm	two/four
HPDE2H	165 rpm	two/four
HPDE2HP	165 rpm	two/four

CLEARANCES

Please allow 9.5 inches (241 mm) to the right of the unit to be able to fully open door on HPDE1 models and 14.3 inches (363 mm) on HPDE2 models.

MODEL FAMILY	WIDTH [A]	HEIGHT	DEPTH	WATTS	VOLTS	AMPS	NEMA PLUG	APPROX. SHIP WEIGHT	APPROX. WEIGHT INSTALLED
HPDE1	9.4 in. (239 mm)	27.1 in. (688 mm)	21 in. (533 mm)	820	120 230	6.8 3.6	5-15P CEE7-7	46 lb. (20.9 kg)	36 lb. (16.3 kg)
HPDE2	14.3 in. (363 mm)	27.1 in. (688 mm)	21 in. (533 mm)	1,000	120 230	8.3 4.4	5-15P CEE7-7	61 lb. (27.7 kg)	50 lb. (22.7 kg)

STAR MANUFACTURING INTERNATIONAL INC.
265 Hobson Street • Smithville, Tennessee 37166
Telephone 800 264 7827 • Fax 314 781 5445
www.star-mfg.com

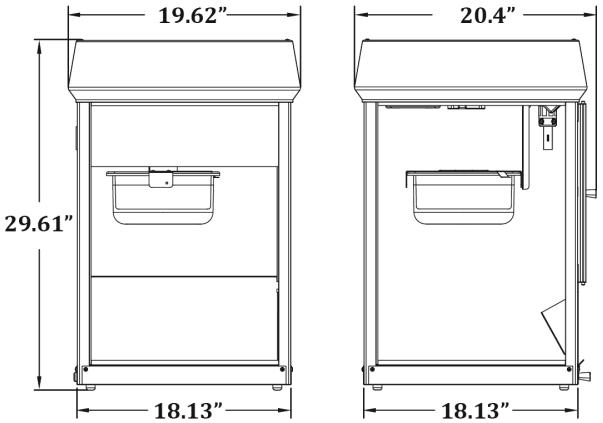
Printed in the U.S.A. • 2M-Z21753 • Rev - • 11.2016
Please refer to the owner's manual for information regarding installation or use.

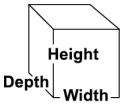
GOLD MEDAL® PRODUCTS CO.

Fun Pop 8 oz. Popper

Model No. 2408

Specifications





Overall Dimensions:

Width: 19.62" (49.9 cm)
Depth: 20.4" (51.8 cm)
Height: 29.61" (75.2 cm)

Features:

- 8 oz. Stainless Steel Kettle
- Red and gold cabinet

Electrical - Domestic

120V
1053 WATTS 60 Hz
(NEMA 5-15P) Plug

Plug Type:

NEMA 5-15P

Agency Approvals:

c UL us LISTED

Gold Medal Products Co.
10700 Medallion Drive, Cincinnati, OH 45241
Ph: (513) 769-7676, (800) 543-0862; Fax: (513) 769-8500
gmpopcorn.com info@gmpopcorn.com

SECTION 11 48 00 - GYMNASIUM EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Overhead-supported basketball backstops
2. Divider Curtain
3. Volleyball Equipment
4. Wall Padding
5. Scoreboards & Shot Clocks
6. Control System

B. Related Sections:

1. Division 16 (Division 26) Electrical Section: Installing electrical power and controller to operate gymnasium equipment

1.2 DESIGN REQUIREMENTS

A. Equipment Loading:

1. Overhead equipment: Locate overhead attachments of equipment in keeping with static equivalent loading and point reactions.

1.3 SUBMITTALS

1. Comply with Section 01330 (01 33 00) – Submittal Procedures.
2. Product Data: Submit manufacturer's product data, including materials, components, fabrication, finish, and installation instructions.
3. Shop Drawings:
    a. Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating locations, quantities, dimensions, tolerances, materials, fabrication, connections, hardware, fasteners,finish, electrical wiring diagrams, options, and accessories.
    b. Show location and detail of attachment to building structure.
4. Samples: Submit manufacturer's color samples.
5. Design Data: Submit manufacturer's design data, indicating static loads and pointreactions
    a. Test Reports: Submit manufacturer's certified test reports from testingperformed by accredited independent testing laboratory, indicating compliance of materials with requirements as specified.
    b. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

c. Manufacturer's Project References: Submit manufacturer's list of recently completed projects, including project name and location, name of architect, and type and quantity of gymnasium and play field equipment installed.
d. Operation and Maintenance Manual: Submit manufacturer's operation and maintenance manual; including operation, maintenance, adjustment,and cleaning instructions; trouble shooting guide; parts list; and electricalwiring diagrams.
e. Warranty: Submit manufacturer's standard and additional warranties.

1.4 QUALITY ASSURANCE

1. Single Source Responsibility: Provide gymnasium and play field equipment fromsingle manufacturer.
2. Manufacturer's Qualifications: Minimum of 5 consecutive years' experience manufacturing gymnasium and play field equipment similar to that specified.
3. Installer's Qualifications: Trained and approved by manufacturer.
4. Manufacturer shall provide documentation showing welders and processes areAWS certified.
5. Regulatory Requirements: Gymnasium and play field equipment shall conform to latest rules and regulations.

A. International Basketball Federation / Federation International de Basketball (FIBA).
B. National Collegiate Athletic Association (NCAA).
C. National Federation of State High School Associations (NFHS).

1.5 WARRANTY

1. Provide 1-year warranty against defects in materials and workmanship, unlessotherwise specified.

PART 2 PRODUCTS

2.1 Manufacturers or equal: Subject to compliance with requirements:

1. Draper, Inc., 411 South Pearl Street, Spiceland, Indiana 47385. Toll Free (800) 238-7999. Phone (765) 987-7999. Fax (765) 987-7142.

2. Porter Athletic, Inc., 601 Mercury Drive, PO Box 1790, Champaign, Illinois 61824-1790. Toll Free (888) 277-7778. Phone (217) 367-8438. Fax (217) 239-2255

3. Substitutions: Requests for substitutions will be considered in accordance withSection 01630 (01 25 13).

2.2 OVERHEAD-SUPPORTED BASKETBALL BACKSTOPS

1. Draper Inc. or equal Model No. EZ Fold TF-20-B or equal. (6 Thus) Ceiling suspended, forward folding, front braced overhead-supported basketball backstop with remote control electric winch and

associated breakaway goal and rectangular fiberglass backboard.

2. Draper Inc. or equal Model No. EZ Fold TF-20-B or equal with EZ Fold Motorized Height Adjuster (8 Thus, for Junior Courts) Ceiling suspended, forward folding, front braced overhead-supported basketball backstop with remote control electric winch and associated breakaway goal and rectangular fiberglass backboard.

3. Electric Winch
   A. Provide for each folding basketball backstop separate electric winch mechanism.

   B. Type: Fully enclosed, direct drive, worm gear, electric winch designed to hold backstop at any position during raising and lowering; Remote control motorized winch.

      a. Motor: 3/4 HP, 11.5 AMP, capacitor type, 60 cycle, 115 volt, single phase with automatic thermal overload protection manufactured in compliance with NEMA specifications.

      b. Hoist cable: [1/4 inch] [6 mm] diameter, 7 by 19, galvanized aircraft cable with [7,000 pounds] [3175 kg] ultimate breaking strength.

      c. Roller: Spring-load providing tensioning pressure to ensure cable tracks evenly on grooved drum.

      d. Limit switches: Rotary counting up and down type, pre-wired to motor as integral part of winch.

   C. Controls: Remote radio control using portable, hand held transmitter.

      a. Provide one wireless receiver for each item being operated; Receiver Model 503060 or equal.

      b. Provide a minimum of [three] Hand Held Transmitters capable of controlling electric winches; Transmitter Model 503061 or equal.

      c. Power supply: 9 volt battery.

      d. Frequency: 286-320 MHz.

      e. Operating range: [100 feet.] [30.48 m.]

4. Safety Belt and Lock
   A. Provide each folding basketball backstop with safety belt and lock test to withstand [1750 pounds] [794 kg] free fall load.

   B. Safety lock: Inertia sensitive to automatically lock backstop in position at any time during storage, raising, or lowering. Sudden increase in either tension or speed shall activate lock.

   C. Safety belt: [2 inches] [51 mm] wide nylon belt rated at [6000 pounds] [2721 kg] breaking strength; Safety Belt [503229] [503230] or equal.

D. Belt shall extend ([36 feet] [10.97 m]-503229) ([46 feet] [14.02 m]-503230) and shall be automatically retracted and stored on reel equipped with constant force spring. Operation and locking action shall be activated by centrifugal force to lock backstop before unit travels [12 feet] [3.7 m] of free fall.

E. Unit shall incorporate automatic reset not requiring poles, ropes, levers, or buttons for resetting.

5. Safety Edge Padding
   A. Type: Foam padding for bottom edge and corners of backboard to provide safety protection to meet NCAA and NFHS requirements; Model 5032XX Safe-Edge Padding or equal.

   B. Construction: Molded foam, [2 inches] [51 mm] wide and wrapping around edges [3/4 inch] [19 mm]. Equip with molded-in steel track and bolt-on attachment system. Padding shall cover bottom edge of backboard and extend [15 inches] [381 mm] up sides.

   C. Color: [Gray].

6. Accessories
   A. Provide backstop with backstop hangers, clamps, brackets, fasteners, and all other hardware required for complete, functional, rigid assembly and installation.

2.3 VOLLEYBALL EQUIPMENT

1. Draper Inc. or equal Model No. Power Volleyball System (3 Thus) #PVS-01 or equal. Two-pole volleyball system

   A. System shall consist of #500004 Power volleyball net, #501006 recessed floor sleeve standards and cover plates #500005 rope tensioner or equal.

2.4 WALL PADDING

1. Porter Athletic or equal 2" foam DuraSafe Wall Pads and Configured Column & Corner Pads.

   A. Wall Pad Dimensions: Typical 2'-0" Wide by 8'-2" High and custom widths around Gymnasium column corners per drawings.

   B. Nailing Margin: 1-inch nailing margin top and bottom for securing panelsto wall.

   C. Foam: 2 in Thick,Polyurethane Foam

   D. Interior Foam: Bonded to 1/2-inch plywood board to minimize warping.

   E. Panel shall meet the min. ASTM F2440 standard specification

   F. Vinyl-Coated Polyester Cover shall meet ASTM E84 Class A testing.

   G. Entire Face of Panel, Including Nailing Margins: Shall be upholstered in19-

Ounce, fire-retardant, high-tensile, vinyl-coated polyester fabric material.

H. Color: As selected by Architect per manufacturer's standard color chart.

2.5 DIVIDER CURTAINS

1. Basis-of-Design: Draper Inc. or equal Model No. Roll-Up Gym Divider Curtain with electric winch.

A. Curtain: Gym divider curtain shall be bottom roll-up type wide by high andshall be in one continuous section. Lower section of curtain shall be 8'-0" high solid vinyl, polyester reinforced 18 oz. vinyl coated fabric (per square yard, containing antibacterial, fungi-resistant and flame-retardant chemicals to meet requirements of ASTM E-84 Class A Rating (25 Flame Spread, 450 Smoke Development), and NFPA-701 large scale, ULC S-109 large and small scale). Upper section of curtain shall be of Fleximesh, designed for air breathing areas in gym dividers, tennis screens or other custom air transfer applications. Fleximesh material shall be an open polyester type interlocking grid weave coated with polyvinyl chloride with an approximate 45 to 50% openarea. Weight of material – 7 oz. per square yard. Flame resistant.

B. Support: Top of curtain shall be fabricated with a pocket to conceal a continuous 1-5/8" O.D. steel tube extending the full length of the fabric toensure proper support. Tube shall be supported from roller support assemblies on adjustable chains not exceeding 14'-0" centers.

C. Belts: Divider curtain shall be neatly and compactly rolled on a 4-1/2" diameter batten tube concealed in the bottom section of the vinyl fabric. Rolling action shall be accomplished by means of multiple hoist belts not to exceed 25'- 0" on center. Belts shall be of a heavy, industrial grade polyester fabric 5" in width. One side of hoist belts shall be provided with a special friction surface, to provide rolling friction against the vinyl fabric in order to facilitate the rolling action of the bottom batten to roll the fabriccompactly and to eliminate wrinkles. Opposite side of hoist belts shall be provided with a smooth surface, to allow for easy cleaning.

D. Shaft Arrangement: Hoist belts shall terminate on continuous zinc-plated2-3/8" O.D. tube line shaft arrangement. Line shaft shall turn in special roller support assemblies equipped with four steel ball bearing wheel rollers. Each roller support assembly shall be positioned adjacent to a hoist belt termination. Support assemblies shall be secured to structural roof framing supports by means of turnbuckles and support chains to provide structural integrity and accommodate all slopes or building camber.

E. Coating: All metal parts not zinc-plated shall be powder coated.

F. Warranty: 1-year limited warranty.
G. Colors: As indicated on drawings.

2.6 CONTROL SYSTEM

1. Power-Touch simultaneous operation wireless enabled gymnasium control center.

A. Operation: Computer, tablet, or wireless device enabled control system capable of operating all athletic equipment and up to 8 units of auxiliary gymnasium electrical equipment. System shall allow for wireless user interface device capability to allow users a full view of moving equipment.System shall be configured on facility network for remote control programming support capabilities.

B. Operation Safety: For safety of operation, interface requires constant interaction with interface to control gymnasium equipment. Equipment shallimmediately stop moving when user stops interaction. User shall agree to be in sight of equipment before equipment can be operated.

C. Control of Auxiliary Equipment: Single touch of appropriate button for on/off devices.

D. Equipment Control Zones: Zones of equipment to be determined by a user's ability to safely see and track all equipment in a zone. Standard zonesize is approximately 12 pieces of equipment, but will be decided and coordinated with owner per project conditions.

E. Graphic Interface: User interface shall be a graphical representation of thefacility to allow users intuitive awareness of equipment being moved and the direction in which it will be moved. Each device will be enabled with anup/hold/down toggle display for the user.

F. Preset Layouts: Users must have the ability to set, re-set, and activate pre-set zone configurations of equipment from any control device.

G. Multiple Device Control Interface: User shall be able to select desired layoutfor any zone through re-programmable presets or by individually selecting desired location of equipment, and move all equipment regardless of the type of equipment to the desired configuration simultaneously whether the equipment is moving to a storage position, play position, or a combination of the two to allow for quick turnover of the facility.

H. Security Code: Four-digit Alpha-Numeric reprogrammable security code toprevent unauthorized use.

I. Multiple Locations: Any network enabled device with browser capability shall be able to be used as a control station if given proper permissions.Only one location can be active at time.

J. Mounting: Electrical box shall be mounted per electrical specs
K. Panel Size: TBD based on project conditions.

L. Relay Panels: Each set of motor relays shall be independently powered by115-volt line power and rated for a minimum of 15 amps. All relays shall bestandard in one electrical enclosure pre-wired to allow for easy installation of control system. Panel to communicate with facility network via Ethernet port located inside the panel.

M. Warranty: 1-year limited warranty.

2.7 SCOREBOARD AND SHOT CLOCKS

1. Varsity Scoreboards Model No. 2230 Basketball / Multisport Scoreboard or equal (2 Thus) with wireless remote control. Wall mounted: 8′ wide x 4′ high x 8″ deep. Locations as indicated on drawings.

2. Varsity Scoreboards Model No. LED-4 Portable Multisport Scoreboard or equal (4 Thus). Tabletop: 22″ wide x 15″ high x 8″ deep.

3. Varsity Scoreboards Model No. 2210 Shot Clock or equal (2 Thus) with wireless remote control. Wall mounted: 24″ x 24″ x 8″ deep. Locations as indicated on drawings.

PART 3 EXECUTION

3.1 COORDINATION

A. Coordinate provision of basketball backstops with construction of roof and ceiling framing supporting basketball backstop to ensure proper support and method of attachment.

B. Coordinate support of backstops to ensure proper distribution of loads and adequacy of attachment points. Provide additional structural framing members as required.

C. Coordinate electrical requirements for electrically operated winches and height adjusters to ensure proper power source, conduit, wiring, and boxes for keyed switches.

D. Prior to installation, verify exact locations of backstops.

3.2 INSTALLATION

A. Install folding basketball backstops in accordance with approved shop drawings and manufacturer's instructions.

B. Install backstops, backboards, and goals plumb, level, and rigid. Attach to roof raming with anchors of size and type recommended by manufacturer.

C. Install (6) backboards such that goals are 10 feet above court floor. Coordinate height of (8) Junior Court backboards with Owner. After installing, verify that mounting heights are correct.

D. Install electrically operated winches, hoisting cables, safety belt and lock securely to operate properly and smoothly to safely lower and raise folding backstops.

3.3 FIELD QUALITY CONTROL

A. Operate each folding basketball backstop a minimum of three times to ensure proper lifting and lowering. Adjust as required to ensure smooth operation and accurate positioning.

B. Operate each backboard and goal height adjuster to ensure proper movement. Adjust limit switches and mechanism as required to ensure smooth operation and accurate positioning.

3.4 CLEANING

A. Remove protective wrappings, wash surfaces, and attach nets.

3.5 DEMONSTRATION

A. Demonstrate to Owner's designated representative complete operation and required maintenance for folding basketball backstops.

B. Submit operation and maintenance manuals in accordance with Section 01 77 00 Closeout Procedures.

END OF SECTION 11 48 00

SECTION 12 24 13 – MANUAL ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Manual operated roller shades with single rollers.

B. Related Requirements:

   1. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
   2. Section 079000 "Joint Sealants" for sealing the perimeters of installation accessories for light- blocking shades with a sealant.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

   1. Manual Operated Shades: Include details of installation.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

   1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

   1. Shadeband Material: Not less than 3 inches (76 mm) square. Mark interior face of material if applicable.
   2. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material.

C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roller shades to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUAL OPERATED, SINGLE-ROLLER SHADES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Draper Inc.
2. MechoShade Systems, Inc.
3. Lutron Electronics Co., Inc.

B. Manual Operating System: Provide factory-assembled, shade system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with operating parts, and accessories required for reliable operation without malfunction.

1. Operator: Crank and gearbox or pull chain operate shades.

C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

E. Shadebands:

1. Shadeband Material: Light-filtering fabric – STEM Lab, Engineering Booth, Sound Booth, Men's Restroom, Coord. Office, Lounge, First Aid, and Office.
   a. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      1) Type: Exposed with endcaps.
      2) Color and Finish: As selected by Architect from manufacturer's full range.
2. Shadeband Material: Light-blocking fabric – Multipurpose room.
   a. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      1) Type: Exposed with endcaps.
      2) Color and Finish: As selected by Architect from manufacturer's full range.
3.

F. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than 3 inches (76 mm).
2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Manufacturer's standard in height required to enclose roller and shadeband assembly when shade is fully open, but not less than 3 inches (76 mm).
3. Endcap Covers: To cover exposed endcaps.
4. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
5. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-filtering Fabric: Opaque fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll- width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, locations of other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Roller Shade Locations: Exterior windows of rooms indicated above.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain roller shades.

END OF SECTION 12 24 13

SECTION 12 36 61.19 - QUARTZ AGGLOMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Quartz agglomerate countertops.
2. Quartz agglomerate backsplashes.
3. Quartz agglomerate end splashes.
4. Quartz agglomerate apron fronts.

B. Related Requirements:

1. Division 22 Section for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

C. Samples for Verification: For the following products:

1. Countertop material, 6 inches (150 mm) square.
2. Wood trim, 8 inches (200 mm) long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For quartz agglomerate countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.

1. Build mockup of typical countertop as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
1. Colors and Patterns: See architectural drawings for selection.

B. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.

C. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."

1. Grade: Custom.

B. Configuration:
   1. See architectural drawings.

C. Countertops: 3/4-inch- (19-mm-) thick, quartz agglomerate with front edge built up with same material.

D. Backsplashes: 3/4-inch- (19-mm-) thick, quartz agglomerate.

E. Fabricate tops with shop-applied edges unless otherwise indicated. Comply with quartz agglomerate manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

   1. Fabricate with loose backsplashes for field assembly.

F. Joints: Fabricate countertops without joints.

G. Joints: Fabricate countertops in sections for joining in field.

   1. Joint Locations: Not within 18 inches (450 mm) of a sink or cooktop and not where a countertop section less than 36 inches (900 mm) long would result, unless unavoidable.
   2. Joint Type: Bonded, 1/32 inch (0.8 mm) or less in width.
   3. Joint Type: Grouted, 1/16 inch (1.5 mm) in width.
   4. Joint Type: Sealant filled, 1/16 inch (1.5 mm) in width.
   5. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints. Make width of cuts slightly more than thickness of splines to provide snug fit.

H. Cutouts and Holes:

   1. Undercounter Plumbing Fixtures: Make cutouts for fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

      a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch (5 mm) into fixture opening.
      b. Provide vertical edges, rounded to 3/8-inch (10-mm) radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch (5 mm) into fixture opening.
      c. Provide 3/4-inch (20-mm) full bullnose edges projecting 3/8 inch (10 mm) into fixture opening.

   2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
   3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by quartz agglomerate manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive quartz agglomerate countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m), 1/4 inch (6 mm) maximum. Do not exceed 1/64-inch (0.4-mm) difference between planes of adjacent units.

B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.

D. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

E. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

1. Install metal splines in kerfs in countertop edges at joints. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
2. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.

F. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

1. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
2. Seal edges of cutouts in particleboard subtops by saturating with varnish.
3. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 12 36 61.19

SECTION 12 48 13 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. This section includes the following types of entrance flooring systems:
   1. Floor Mats & Frame Assemblies

B. Related Sections: The following sections contain requirements related to this section:
   1. Grouting frames into recess; refer to sections 03300 "Cast-In-Place Concrete."

2.1 REFERENCES

A. American Society for Testing and Materials (ASTM)

B. The Aluminum Association

C. The Carpet and Rug Institute (CRI)

D. The National Floor Safety Institute (NFSI)

E. International Organization for Standardization (ISO)

3.1 SUBMITTALS

A. General: Submit the following in accordance with conditions of contract and Division 1 specification section 013000.

B. Product data for each type of floor mat and frame specified including manufacturer's specifications and installation instructions.

C. Shop drawings in sufficient detail showing layout of mat and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.

D. Samples for verification purposes: Submit an assembled section of floor mat and frame members with selected tread insert showing each type of color for exposed floor mat, frame and accessories required.

E. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor mats.

4.1 QUALITY ASSURANCE

A. Flammability in accordance with ASTM E648, Class 1, Critical Radiant Flux, minimum 0.45 watts/m^2.

B. Slip resistance in accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 for accessible routes.

C. Standard rolling load performance is 350 lb./wheel with larger loading requirements as specified (load applied to a solid 5" x 2" wide polyurethane wheel, 1000 passes without damage.

D. Single Source Responsibility: Obtain floor mats and frames from one source of a single manufacturer.

E. Utilize superior structural aluminum alloy 6063-T6 for rail connectors.

F. Utilize a manufacturer that is ISO 9001 & 14001 certified.

5.1 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

6.1 PROJECT CONDITIONS

A. Field measurements: Check actual openings for mats by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

B. Recessed Conditions: IMPORTANT: Coordination with Division 03 00 00 Concrete specifications is required. For proper installation, the concrete recess must be flat and smooth throughout. If the recess is formed by a concrete contractor, the pour dimensions may require leveling grout to achieve the proper depth and a smooth finish. The final recess depth will match the specified product and must be field verified. For proper frame installation, the side walls of the concrete recess must also be straight and smooth. Inconsistencies with the recess and side walls must be remediated prior to product installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Drawings and specifications are based on manufacturer's literature from Construction Specialties, Inc. unless otherwise indicated. Other manufacturers must comply with the minimum levels of material and detailing indicated on the drawings and specified herein.

2.02 MATERIALS

A. Aluminum - ASTM B 221, alloys 6063-T5, 6063-T6 for extrusions.

B. Architectural Bronze - ASTM B 455, copper/zinc alloy C38500 for extrusions.

C. Regrind PETG/Polyurethane extrusion.

D. Flexible EPDM extrusions.

E. Tread insert options - refer to section 2.05.

2.03 FLOOR MATS

A. Model and Description – See drawings for selection.

2.04 MAT FRAMES

A. Tapered Angle Frame shall be a 1/4" deep recessed frame in 6063-T5 aluminum alloy. Clear anodized finish.

B. Threshold Frame shall be supplied in 6063-T6 aluminum alloy. For surface/recess installations to provide a flush transition from the entryway door threshold to the mat surface.

2.05 TREAD INSERT OPTIONS

A. Exterior Carpet shall be solution dyed polypropylene fibers with 50/50 blend of 600/12-denier multi filament and 595/D1 monofilament, available in one of standard colors as offered by manufacturer. The texturized fibers have ultraviolet blockers and color as an integral part of the filament. Each carpet fiber and monofilament shall be fusion-bonded to a rigid two-ply backing to prevent fraying and supplied in continuous splice-free lengths. (Waterproof fibers do not get soggy, rot, fade or stain.) Carpet weight shall be 32- oz./yd^2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 Preparation

A. Manufacturer shall offer assistance and guidance to provide a template of irregular shaped mat assemblies to ensure a proper installation.

3.03 INSTALLATION

A. Install the work of this section in strict accordance with the manufacturer's recommendations.

B. Set mat at height recommended by manufacturer for most effective cleaning action.

C. Coordinate top of mat surface with bottom of doors that swing across to provide ample clearance between door and mat.

3.04 CLEANING

A. It is important to the life cycle of the entrance mat that a maintenance schedule be developed which includes regular vacuuming and extraction that correctly matches the amount of traffic the mat incurs.

3.05 PROTECTION

A. After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recess, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

B. Defer installation of floor mats until time of substantial completion of project.

END OF SECTION 12 48 13

SECTION 12 50 00 – FURNITURE PACKAGE

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, shall apply to work specified in this section.

1.2 GENERAL DESCRIPTION OF WORK

A. Work in this section shall include furniture selection and installation throughout the facility. All work shall be in complete accordance with the drawings and this specification.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product information, specifications and installation instructions for components and accessories.

1.4 WARRANTY

A. Provide manufacturers standard warranties for furniture beginning the day of Substantial Completion of Installation.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Furniture: As indicated on drawings and attached furniture package or equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Order long-lead furniture items in advance to insure arrival and installation of furniture items in advance of project's completion date.

B. Coordinate furniture installation after work associated with other trades is complete and cleaned.

3.2 PROTECTION

A. Extreme care shall be taken to protect furniture items during and after installation.

ITEM #	AV
MFR MODEL #	10086175
DESCRIPTION	NEEWER 2.6x3M/ 8.5x10Ft Background Support System and 800W 5500K Umbrellas Softbox Continuous Lighting Kit
FABRIC/FINISH	
LOCATION	Stem Lab
QUANTITY	1
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

CCR ARCHITECTURE & INTERIORS

PANAMA CITY MLK RECREATION CENTER

705 14TH COURT EAST
PANAMA CITY, FL 32401

CONTACT: JACKLYN HAMRIC
PHONE: 205-324-8864
EMAIL:
JACKLYN@CCRARCHITECTURE.COM

PLAN KEY

AV

ITEM #	B1
MFR MODEL #	VERSATRACT
DESCRIPTION	IRWIN SEATING COMPANY 4 Row Telescopic bleachers w/ 22” spacing Open Dimensions 7’ 3” D / Closed Dimensions: 3’ 7” D
FABRIC/FINISH	Custom colors and logo
LOCATION	Gymnasium
QUANTITY	7 units 15ft L each
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

CCR ARCHITECTURE & INTERIORS

PANAMA CITY MLK RECREATION CENTER
705 14TH COURT EAST
PANAMA CITY, FL 32401

CONTACT: JACKLYN HAMRIC
PHONE: 205-324-8864
EMAIL:
JACKLYN@CCRARCHITECTURE.COM

PLAN KEY

B1

ITEM #	B2
MFR MODEL #	ABI12NB-P
DESCRIPTION	BELSON Indoor Backless Team Benches w/ foot pads 7’ 1/2” Extruded aluminum seat and frame Rubber foot pads
FABRIC/FINISH	Aluminum
LOCATION	Gymnasium
QUANTITY	27
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

CCR ARCHITECTURE & INTERIORS

PANAMA CITY MLK RECREATION CENTER
705 14TH COURT EAST
PANAMA CITY, FL 32401

CONTACT: JACKLYN HAMRIC
PHONE: 205-324-8864
EMAIL:
JACKLYN@CCRARCHITECTURE.COM

PLAN KEY

B2

ITEM #	C1
MFR MODEL #	HZ143PA
DESCRIPTION	JSI HOOPZ Stacking Chair Guest Chair, Plastic Perforated back, 22D x 21 3/4W x 33H Stacks 10 high on the floor or 45 on the cart
FABRIC/FINISH	TBM, Tricom Black Chrome Metal Frame
LOCATION	Multi Purpose Room
QUANTITY	150
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

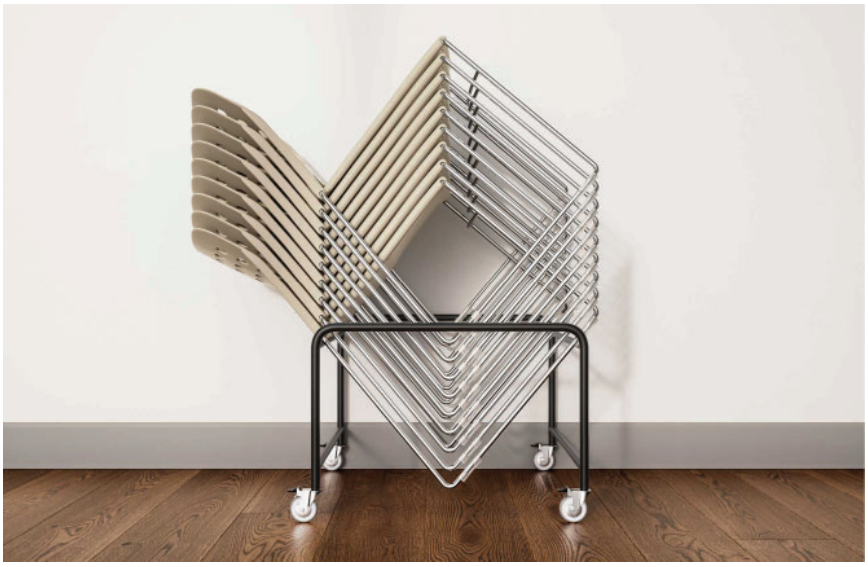
CCR ARCHITECTURE & INTERIORS

PANAMA CITY MLK RECREATION CENTER
705 14TH COURT EAST
PANAMA CITY, FL 32401

CONTACT: JACKLYN HAMRIC
PHONE: 205-324-8864
EMAIL:
JACKLYN@CCRARCHITECTURE.COM

PLAN KEY

C1



ITEM #	C1 carts
MFR MODEL #	HZ140
DESCRIPTION	JSI HOOPZ Stacks up to 45 chairs high Welded Steel Frame, two locking casters, only available in black, capacity: 45 chairs, total height with 45 chairs stacked on cart is 7'. 30"D x 26"W x 19"H
FABRIC/FINISH	only available in black
LOCATION	Storage
QUANTITY	3
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C1 CARTS

ITEM #	C2
MFR MODEL #	ALSO 3514
DESCRIPTION	KEILHAUER ALSO 3514. 4 Leg counter stool with arms, perforated contour seat & back 22.5”W x 24”D x 38.5”H / SH: 25.5” AH: 34.75”
FABRIC/FINISH	Shell: Black 15 Frame : Nickel PC00
LOCATION	Reading Rooms and Teaching Kitchen
QUANTITY	11
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C2

ITEM #	C3
MFR MODEL #	DWW-MHWNO
DESCRIPTION	ALLSTEEL EVO Task Chair w/ adjustable arms and mesh high back 4D Arms 38 1/2 - 43 1/2 H x 26W x 26 D
FABRIC/FINISH	Mesh color: Lustre L Frame: Black BLK Casters: H Black Hard Tread
LOCATION	Office, Reception, First Aid
QUANTITY	5
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C3

ITEM #	C4
MFR MODEL #	HZ143PA
DESCRIPTION	JSI HOOPZ Stacking Chair Guest Chair, Plastic Perforated back, 22D x 21 3/4W x 33H Stacks 10 high on the floor or 45 on the cart
FABRIC/FINISH	DGM, Dancing Green Chrome Metal Frame
LOCATION	Adult Reading, Arts/ Crafts
QUANTITY	20
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C4

ITEM #	C5
MFR MODEL #	ACEGUM Dual upholstery
DESCRIPTION	ALLSTEEL ROCK Lounge Chair Soft Rocker 31D x 31W x 31H
FABRIC/FINISH	Options include single or dual upholstery COM Allow $ 60 sq yd upholstery w/ dual upholstery
LOCATION	Study Reading Room
QUANTITY	4
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C5

ITEM #	C6
MFR MODEL #	78023
DESCRIPTION	KEILHAUER WUNDER Full Lounge Chair With Glides 30”D x 28.75W x 31.75H
FABRIC/FINISH	COM Allow $ 60 sq yd upholstery
LOCATION	Lounge
QUANTITY	6
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C6

ITEM #	C7
MFR MODEL #	RKV100H18BR
DESCRIPTION	KI RUCKUS Stack Chair with Casters and Bookbag Rack Polypropylene Seat
FABRIC/FINISH	Poly Color: Rubber Ducky BRRK Base / Frame: Starlight Silver Metallic SX Book Bag Rack: Starlight Silver Metallic BRSX
LOCATION	Stem Lab
QUANTITY	14
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C7

ITEM #	C8
MFR MODEL #	RK4100H24BR
DESCRIPTION	KI RUCKUS 24” H Stool w/ Nylon Glides and Bookbag Rack Counter Height Polypropylene Seat
FABRIC/FINISH	Poly Color: Ultra Blue PUB Base Frame: Starlight Silver Metallic SX Bookbag Rack: Starlight Silver Metallic BRSX
LOCATION	Stem Lab
QUANTITY	10
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C8

ITEM #	C9
MFR MODEL #	DN5A
DESCRIPTION	KI DONI Task Chair w/arms 2 Tone Shell Poly
FABRIC/FINISH	Outside Nemo/ Inside Cottonwood ONE/ICO Base Color: Polished Aluminum Carpet Casters CCC
LOCATION	Engineering Booth, Sound Booth
QUANTITY	8
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C9

ITEM #	C10
MFR MODEL #	3000COBLR-COM
DESCRIPTION	MOORECO Lounge Soft Seating 22.5 Chair Outside Curve Armless
FABRIC/FINISH	COM Allow $60 sq yd upholstery
LOCATION	Stem Lab
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C10

ITEM #	C11
MFR MODEL #	8000T- COM
DESCRIPTION	MOORECO Kids Lounge Soft Seating 22.5 Bench w/HPL table top
FABRIC/FINISH	COM Allow $60 sq yd upholstery HPL color to be specified
LOCATION	Stem Lab
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

C11

ITEM #	D1
MFR MODEL #	Custom
DESCRIPTION	Main + Return Worksurfaces , T-Leg , L-Configuration, standard Height
FABRIC/FINISH	Plastic Laminate Wood Look Standard Finish w/ Box File
LOCATION	Office 102
QUANTITY	1
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

D1

ITEM #	D2
MFR MODEL #	Custom
DESCRIPTION	T-Leg Base, Standard Height Height-Adjustable desk, 48” W X 30” D
FABRIC/FINISH	Plastic Laminate Wood Look, Standard Finish
LOCATION	First Aid 103
QUANTITY	1
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

D2

ITEM #	D3
MFR MODEL #	Custom
DESCRIPTION	T-Leg Base, Standard Height Height-Adjustable desk, 72” W X 30” D
FABRIC/FINISH	Plastic Laminate Light Wood Look, Standard Finish
LOCATION	Engineering Booth 138
QUANTITY	1
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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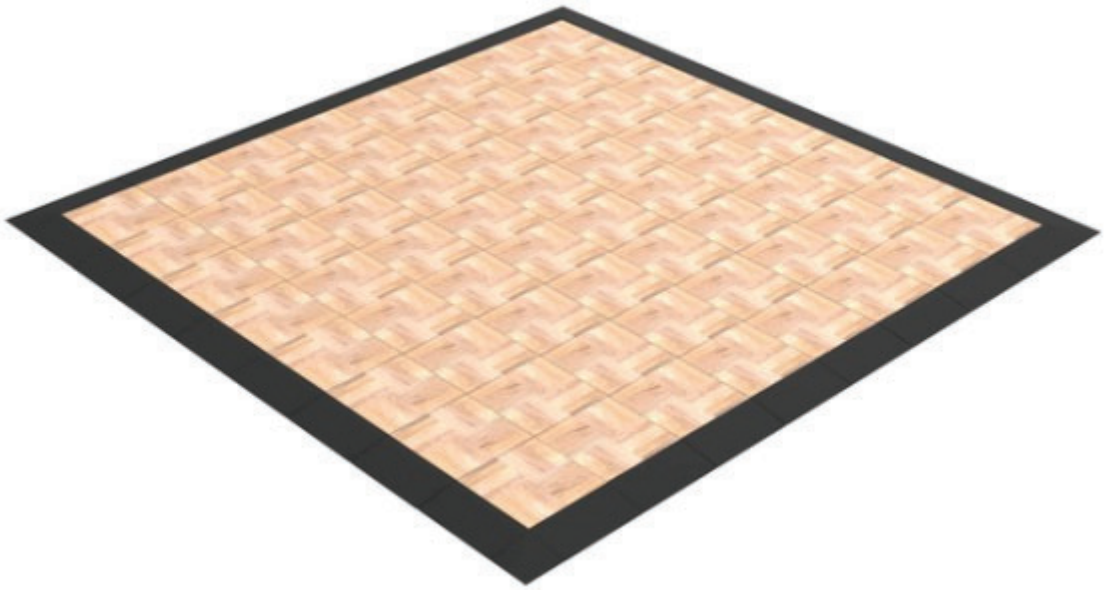
PLAN KEY

D3



ITEM #	F1
MFR MODEL #	5400069
DESCRIPTION	EVERBLOCK FLOORING, EVERDANCE FLOOR 24' x 24' 576 sq ft EverDance Modular Dance Floor,12" x 12" interlocking square pieces and corner edging
FABRIC/FINISH	Gray Parquet
LOCATION	Multipurpose Room
QUANTITY	576 squares / 4 black corner ramps /48 female black edge ramps / 48 male
	black edge ramps
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

F1

ITEM #	F1 Carts
MFR MODEL #	5000036
DESCRIPTION	EVERBLOCK FLOORING Transport Cart Transports up to 400 sq ft of EverDance Floor 38” L x 38”W
FABRIC/FINISH	Dark Gray
LOCATION	Storage
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

F1 CARTS

ITEM #	R1
MFR MODEL #	Economy Easy-Lite Stage Kits
DESCRIPTION	THE STAGE DEPOT 192 SQ. FT Stage System w/ Skirting 12 FT X 16 FT X 16” Complete Stage System
FABRIC/FINISH	Tuffcoat Finish/ Hardware and 3 Sides of Stage Skirts/ 3’ Wide Carpeted Stairs/ 3 Side Guardrails / Platform and Cart for Storage
LOCATION	STEM LAB
QUANTITY	12 4’ X 4’ Carpeted Platforms / 12 16” Risers
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

R1

ITEM #	S1
MFR MODEL #	MZE02, MZE04, MZE06, MZE09
DESCRIPTION	ALLEMUIR MAYZE Modular seating
FABRIC/FINISH	COM Allow $60 sq yd upholstery
LOCATION	Lounge 104
QUANTITY	3 Units MZE02, 1 Unit MZE04, 1 Unit MZE06, 1 Unit MZE09
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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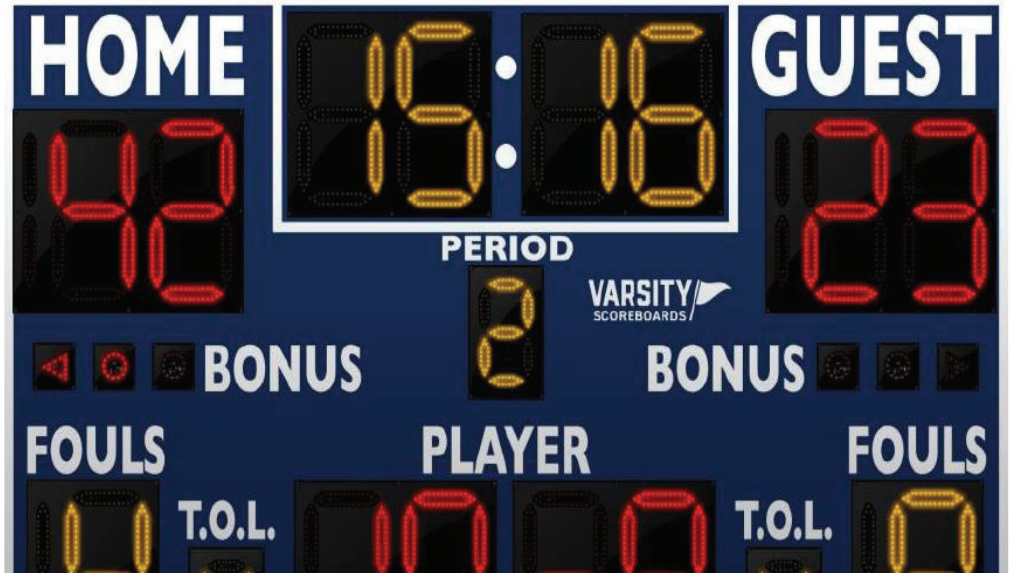
PLAN KEY

S1

Model 2246 Basketball/Multisport Scoreboard



ITEM #	SC1
MFR MODEL #	MODEL 2246
DESCRIPTION	Basketball / Multisport Scoreboard Wall Mounted 8’ x 5’ x 8’
FABRIC/FINISH	Color: Black
LOCATION	Gymnasium
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

SC1

LED-4 Portable Multisport Scoreboard

ITEM #	SC2
MFR MODEL #	
DESCRIPTION	LED Portable Multisport Scoreboard Deluxe tabletop model scores most popular indoor sports Size: 22” x 15” x 8”
FABRIC/FINISH	Color: Black
LOCATION	Gymnasium
QUANTITY	4
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

SC2

ITEM #	SC3
MFR MODEL #	
DESCRIPTION	Varsity Scoreboards, Model 2210 Basketball Shot Clock 24” x 24” x 8”
FABRIC/FINISH	Color: Black
LOCATION	Gymnasium
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

SC3

ITEM #	ST1
MFR MODEL #	RKT441842DRT/36T
DESCRIPTION	KI RUCKUS Tote Storage w/ 3” and 6” totes Tall 3 Column w/door and Laminate Top 44”W x 18”D x 42”H
FABRIC/FINISH	Laminate: Lapis Blue Edge: Ultra Blue Shell: Cottonwood
LOCATION	Coordinator Office
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

ST1

ITEM #	ST2
MFR MODEL #	RKC541842OP
DESCRIPTION	KI RUCKUS Cubby w/Laminate top Single Face 3 x 3 open units w/glides 54”W x 18”D x 42”H
FABRIC/FINISH	Laminate: Lapis Blue Edge: Ultra Blue Shell: Cottonwood
LOCATION	Coordinator Office
QUANTITY	1
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

ST2

ITEM #	T1
MFR MODEL #	DLR72
DESCRIPTION	KI DURALITE Lightweight Round Folding Table Fixed Height 72” Diameter
FABRIC/FINISH	Top color: Blue Grey TGR or Sand TSA Frame: Black
LOCATION	Multipurpose Room
QUANTITY	21
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T1

ITEM #	T1 CARTS
MFR MODEL #	KTR9
DESCRIPTION	KI DURALITE Folding Table Vertical Storage Caddy for Round Tables Capacity: 10 tables Four 5” wheels: 2 fixed, 2 swivel for maneuverability 32-5/8 x 55-1/4”
FABRIC/FINISH	Enamel: Beige BE
LOCATION	Storage
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T1 CARTS

ITEM #	T2
MFR MODEL #	DL3072
DESCRIPTION	KI DURALITE Lightweight Rectangular Folding Table Fixed Height 30” x 72”
FABRIC/FINISH	Top color: Blue Grey TGR Frame: Black
LOCATION	Multipurpose Room, Gym
QUANTITY	28
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T2

ITEM #	T2 CARTS
MFR MODEL #	(KTV68
DESCRIPTION	KI DURALITE Folding Table Vertical Storage Caddy Capacity: 9 tables Four 5” wheels: 2 fixed, 2 swivel for maneuverability 26-5/8W x 78”L
FABRIC/FINISH	Enamel: Beige BE
LOCATION	Storage
QUANTITY	3
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T2 CARTS

ITEM #	T3
MFR MODEL #	RTEAA3072
DESCRIPTION	KI, RUCKUS Activity Table Fixed Height Rectangle 30”D X 72”W X 29”H Rounded corners w/CASTERS
FABRIC/FINISH	Laminate: Marker board White Edge: Cool Grey Base: Starlight Silver Metallic
LOCATION	Stem Lab, Sound Booth
QUANTITY	8
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T3

ITEM #	T4
MFR MODEL #	PST36-15RDB
DESCRIPTION	JSI PROST 15”H Cylinder Column Coffee Table (powered) with 3” black laminate plinth and nylon tack glides, with power module in top 36D x 36W x 15H
FABRIC/FINISH	Laminate, Wood Look, Standard Finish
LOCATION	Lounge, Study 118
QUANTITY	3
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T4

ITEM #	T5
MFR MODEL #	PST24-21RDB
DESCRIPTION	JSI PROST 21”H Cylinder Column SideTable with 3” Plinth 3” black laminate plinth and nylon tack glides 24D x 24W x 21H
FABRIC/FINISH	Laminate, Wood Look, Standard Finish
LOCATION	Lounge
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T5

ITEM #	T6
MFR MODEL #	Top: LK-TT29-3072T / Base: LK-TBF-TT29-3072
DESCRIPTION	JSI LOK Training Table Rectangle top with eased edge and fixed base
FABRIC/FINISH	Laminate: Designer White DWH PVC edge: Designer White DWH No power N
LOCATION	Adult Reading
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T6

ITEM #	T7
MFR MODEL #	RTEFA4272
DESCRIPTION	KI, RUCKUS Rectangle Activity Table w/ Rounded Corners Sit Stand Height Adjustable 29-42” 30” X 72” w/casters
FABRIC/FINISH	Laminate Finish: Makerboard White Edge Color: Cool Grey Leg Finish: Straight Silver Metallic
LOCATION	Arts & Crafts
QUANTITY	3
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T7

ITEM #	T8
MFR MODEL #	RTEFA4272
DESCRIPTION	KI, RUCKUS Rectangle Activity Table w/ Rounded Corners Sit Stand Height Adjustable 29-42” 42” X 72” w/casters
FABRIC/FINISH	Laminate Finish: Makerboard White Edge Color: Cool Grey Leg Finish: Straight Silver Metallic
LOCATION	Stem Lab
QUANTITY	2
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T8

ITEM #	T10
MFR MODEL #	RTEAB48
DESCRIPTION	KI RUCKUS Fiixed Height Round Pillar Table w/ nylon glides 48”Diameter x 29”H
FABRIC/FINISH	Laminate: Makerboard White Edge color: Ultra Blue Leg Finish: Starlight Silver Metallic
LOCATION	Coordinator Office
QUANTITY	1
PRICE EACH	
ACCEPTABLE ALTERNATIVES	

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PLAN KEY

T9

SECTION 13 34 19 – PRE-ENGINEERED METAL BUILDING (PEMB) 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. Structural-steel framing.
2. Metal wall panels.
3. Accessories.

B. Related Requirements:
1. Section 01 23 00 “Alternates” for components revised under bid alternates.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings with PEMB shop drawings.

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

C. Coordinate metal building assemblies and framing with interior building systems, utilities, and gymnasium equipment. See section 01 31 00 Project Management Coordination as well as Divisions 22, 23 and 26 for coordination.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to metal building systems including, but not limited to, the following:

a. Condition of foundations and other preparatory work performed by other trades.
b. Structural load limitations.
c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Required tests, inspections, and certifications.
e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:

a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
b. Structural limitations of purlins and rafters during and after roofing.
c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
d. Temporary protection requirements for metal roof panel assembly during and after installation.
e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
b. Structural limitations of girts and columns during and after wall panel installation.
c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
d. Temporary protection requirements for metal wall panel assembly during and after installation.
e. Wall observation and repair after metal wall panel installation.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Metal roof panels.
b. Metal wall panels.
c. Foamed-insulation-core metal panels.
d. Metal soffit panels.
e. Thermal insulation and vapor-retarder facings.
f. Personnel doors and frames.
g. Windows.
h. Louvers.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:

1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

    a. Show provisions for attaching roof curbs service walkways platforms and pipe racks.

3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

    a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
    b. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.

4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):

    a. Flashing and trim.
    b. Gutters.
    c. Downspouts.
    d. Service walkways.

C. Samples for Initial Selection: For units with factory-applied finishes.

D. Samples for Verification: For the following products:

1. Panels: Nominal 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
2. Flashing and Trim: Nominal 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Vapor-Retarder Facings: Nominal 6-inch- (150-mm-) square Samples.
4. Windows: Full-size, nominal 12-inch- (300-mm-) long frame Samples showing typical profile.
5. Accessories: Nominal 12-inch- (300-mm-) long Samples for each type of accessory.

E. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For erector and manufacturer.

B. Welding certificates.

C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificates: For qualified erector, from manufacturer.

E. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

F. Source quality-control reports.

G. Field quality-control reports.

H. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.

I. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for typical wall metal panel including accessories.

a. Size: 48 inches (1200 mm) long by 96 inches (1200 mm).

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.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, 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. Protect foam-plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 30 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:
1. Inland Building Systems; a Schulte Building Systems Company.
2. Bigbee Steel Buildings, Inc.
3. APEC – Pre-Engineered Metal Building Components.
4. American Buildings Company.
5. Nucor Building Systems; a Nucor company.

B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source.

2.2 SYSTEM DESCRIPTION

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

B. Primary-Frame Type:

1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.
2. Lean-to: Solid- or truss-member, structural-framing system, designed to be partially supported by another structure.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.

E. Eave Height: As indicated on Drawings.

F. Bay Spacing: As indicated on Drawings.

G. Roof Slope: 2 inches per 12 inches (1:6).

H. Roof System: Manufacturer's standard standing-seam, vertical-rib, metal roof panels.

I. Exterior Wall System: Manufacturer's standard foamed-insulation-core metal wall panels.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.
2. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
3. Deflection and Drift Limits: No greater than the following:

a. Purlins and Rafters: See structural drawings.
b. Girts: See structural drawings.
c. Metal Roof Panels: Vertical deflection of 1/360 of the span.
d. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

f. Lateral Drift: See structural drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.

D. Fire Propagation Characteristics: Exterior wall assemblies containing foam plastics pass NFPA 285 fire test.

E. 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 NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

F. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.

G. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.05 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

H. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.01 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 20 psf.

I. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

J. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 20 psf.

K. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

L. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C1363 or ASTM C518:

1. Roof:

a. R-Value: As indicated on Drawings.

2. Walls:

a. R-Value: As indicated on Drawings.

2.4 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
3. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
4. Truss-Frame, Clear-Span Frames: Rafter frames fabricated from joist girders, and I-shaped column sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
5. Truss-Frame Modular Frames: Rafter frames fabricated from joist girders, and I-shaped column sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
6. Long-Bay Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.

7. Frame Configuration: Single gable with Lean-to, with high side connected to and supported by gable structure.
8. Exterior Column: Tapered.
9. Rafter: Tapered.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- (64-mm-) wide flanges.

   a. Depth: As indicated on Drawings.
2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- (64-mm-) wide flanges.

   a. Depth: As indicated on Drawings.

3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
4. Flange Bracing: Minimum 2-by-2-by-1/8-inch (51-by-51-by-3-mm) structural-steel angles or 1-inch- (25-mm-) diameter, cold-formed structural tubing to stiffen primary-frame flanges.
5. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.
6. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch (76-by-51-mm), fabricated from zinc-coated (galvanized) steel sheet.
7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

G. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.

1. Type: As indicated.

H. Bracing: Provide adjustable wind bracing as follows:

1. Rods: ASTM A36/A36M; ASTM A572/A572M, Grade 50 (345); or ASTM A529/A529M, Grade 50 (345); minimum 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.
2. Cable: ASTM A475, minimum 1/4-inch- (6-mm-) diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
5. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

I. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

J. Materials:

1. W-Shapes: ASTM A992/A992M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
3. Plate and Bar: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).
4. Steel Pipe: ASTM A53/A53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A1011/A1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A1008/A1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or HSLAS, Grades 45 through 70 (310 through 480).
7. Metallic-Coated Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.
8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
    b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, SS, Grade 50 or 80 (340 or 550); with Class AZ50 (AZM150) coating.
9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563 (ASTM A563M) carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.

10. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M,Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

11. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (Grade A490M), Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
12. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1 hardened carbon-steel washers.

    a. Finish: Plain.

13. Headed Anchor Rods: ASTM F1554, Grade 36

    a. Configuration: Straight.
    b. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.
    c. Plate Washers: ASTM A36/A36M carbon steel.
    d. Washers: ASTM F436 (ASTM F436M) hardened carbon steel.
    e. Finish: Plain.

14. Threaded Rods: ASTM A36/A36M

    a. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.
    b. Washers: ASTM F436 (ASTM F436M) hardened carbon steel.
    c. Finish: Plain.

K. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

1. Clean and prepare in accordance with SSPC-SP2.
2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil (0.025 mm).

    a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.

2.5 PERSONNEL DOORS AND FRAMES

A. Swinging Personnel Doors and Frames: As specified in Section 081113 "Hollow Metal Doors and Frames."

2.6 WINDOWS

A. Aluminum Windows: As specified in Section 084100 "Aluminum Entrances and Storefronts."

B. Glazing: Comply with requirements specified in Section 088000 "Glazing."

2.7 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall 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- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch (0.76-mm) nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

D. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- (2438-mm-) long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

E. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; SEE DRAWINGS FOR FINISH. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

F. Roof Curbs: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch (1.21-mm) nominal uncoated steel thickness prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.

1. Curb Subframing: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch (1.52-mm) nominal uncoated steel thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.
2. Insulation: 1-inch- (25-mm-) thick, rigid type.

G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

H. Materials:

1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

    a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
    b. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
    c. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws[, with EPDM sealing washers bearing on weather side of metal panels].
    d. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head[, with EPDM sealing washers bearing on weather side of metal panels].
    e. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
    f. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
4. Metal Panel Sealants:

a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
b. Joint Sealant: ASTM C920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.8 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.9 SOURCE QUALITY CONTROL

A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.

1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.

a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. 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. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. 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 will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.

    a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), noncumulative; level, plumb, and on location lines; and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Between Doors and Frames at Jambs and Head: 1/8 inch (3 mm).
2. Between Edges of Pairs of Doors: 1/8 inch (3 mm).
3. At Door Sills with Threshold: 3/8 inch (9.5 mm).
4. At Door Sills without Threshold: 3/4 inch (19.1 mm).
5. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.

C. Field Glazing: Comply with installation requirements in Section 088000 "Glazing."

D. Door Hardware:

1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics specified in Section 079200 "Joint Sealants."

3.6 WINDOW INSTALLATION

A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.

1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.

B. Set sill members in bed of sealant or with gaskets, for weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

3.7 ACCESSORY INSTALLATION

A. General: 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 roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. 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. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, 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 to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Tie downspouts to underground drainage system indicated.

E. Louvers: Locate and place louver units level, plumb, and at indicated alignment with adjacent work.

1. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.
3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of corrosion-resistant paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
4. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

F. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.8 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 ADJUSTING

A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.

B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.

1. Adjust louver blades to be weathertight when in closed position.

3.10 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates,] and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

D. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

F. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.

1. Immediately before final inspection, remove protective wrappings from doors and frames.

G. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

H. Louvers: Clean exposed surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

1. Restore louvers damaged during installation and construction period so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

a. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 13 34 19

Martin Luther King Jr. Recreation Center

VOLUME 2 OF 2

705 14th Court East
Panama City, Florida 32401

New community center and gymnasium with associated sitework amenities and parking.

CCR Project 21109

STATE OF FLORIDA
TAMMY DANIELS COHEN
Tammy D. Cohen
AR0015450
REGISTERED ARCHITECT

OWNER
City of Panama City, Florida
501 Harrison Avenue
Panama City, Florida 32401

ARCHITECT
CCR Architecture & Interiors
2920 First Avenue South
Birmingham, Alabama 35233

Roman Gary
roman@ccrarchitecture.com
05/18/2023

CCR ARCHITECTURE & INTERIORS

PROJECT MANUAL

FOR

PANAMA CITY

MLK RECREATION CENTER

705 14TH COURT EAST

PANAMA CITY, FLORIDA 32401

PROJECT CCR–21109

MAY 18, 2023

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Project No. CCR—21109
May 18, 2023

SPECIFICATION FOR
MARTIN LUTHER KING JR. RECREATION CENTER
705 14TH COURT EAST - PANAMA CITY, FL 32401
CONTRACT SPECIFICATIONS

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SECTION 210517 - SLEEVES AND SLEEVE SEALS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 210517

SECTION 210518 - ESCUTCHEONS FOR FIRE-SUPPRESSION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace escutcheons and floor plates damaged during transport, storage and installation with new materials.

END OF SECTION 210518

SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restraining braces.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: D.
2. Seismic Design Category: C
3. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.

a. Component Importance Factor: 1.0.

1.4 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC and NFPA 13 unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

B. Manufacturers or equal: Subject to compliance with requirements:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

C. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

D. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central

threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

2.2 SEISMIC-RESTRAINT DEVICES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

E. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

F. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

G. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
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 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.
3. Brace a change of direction longer than 12 feet.

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 component.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.2 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

END OF SECTION 210548

SECTION 210553 - IDENTIFICATION FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Equipment-Label Schedule: Include a listing of all equipment to be labeled and the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

C. Equipment-Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the

Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.

B. Letter Color: Red.

C. Background Color: White.

D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

E. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

F. Fasteners: Stainless-steel rivets or self-tapping screws.

G. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe-Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; pipe size; and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 LABEL INSTALLATION

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 or permanently fasten labels on each major item of mechanical equipment.

D. Locate equipment labels where accessible and visible.

E. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection excluding short takeoffs. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION 210553

SECTION 211200 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Hose connections.
4. Fire-department connections.
5. Alarm devices.
6. Pressure gages.

B. Related Sections:

1. Division 21 Section "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
2. Division 28 Section "Digital, Addressable Fire-Alarm System" for alarm devices not specified in this Section.

1.2 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose stations. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

B. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at each hose-connection outlet is as follows:

a. NPS 1-1/2 Hose Connections: 65 psig.
b. NPS 2-1/2 Hose Connections: 100 psig.

2. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:

a. NPS 1-1/2 Hose Connections: 100 psig.
b. NPS 2-1/2 Hose Connections: 175 psig.

C. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-suppression standpipes. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Welding certificates.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14, "Installation of Standpipe and Hose Systems."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Malleable- or Ductile-Iron Unions: UL 860.

D. Cast-Iron Flanges: ASME B16.1, Class 125.

E. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

F. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

G. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Anvil International, Inc.
    b. Corcoran Piping System Co.
    c. National Fittings, Inc.
    d. Shurjoint Piping Products.
    e. Tyco Fire & Building Products LP.
    f. Victaulic Company.

2. Pressure Rating: 175 psig minimum.
3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
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, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick.

1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. AFAC Inc.
b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
c. Anvil International, Inc.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Crane Co.; Crane Valve Group; Stockham Division.
h. Fire-End & Croker Corporation.
i. Fire Protection Products, Inc.
j. Fivalco Inc.
k. Globe Fire Sprinkler Corporation.
l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.
n. Matco-Norca.
o. Metraflex, Inc.
p. Milwaukee Valve Company.
q. Mueller Co.; Water Products Division.
r. NIBCO INC.
s. Potter Roemer.
t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.

aa. Watts Water Technologies, Inc.

2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Stockham Division.
   c. Milwaukee Valve Company.
   d. NIBCO INC.
   e. United Brass Works, Inc.

2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. American Valve, Inc.
   c. Clow Valve Company; a division of McWane, Inc.
   d. Crane Co.; Crane Valve Group; Crane Valves.
   e. Crane Co.; Crane Valve Group; Jenkins Valves.
   f. Crane Co.; Crane Valve Group; Stockham Division.
   g. Hammond Valve.
   h. Milwaukee Valve Company.
   i. Mueller Co.; Water Products Division.
   j. NIBCO INC.
   k. Shurjoint Piping Products.
   l. Tyco Fire & Building Products LP.
   m. United Brass Works, Inc.
   n. Watts Water Technologies, Inc.

2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Anvil International, Inc.

b. Fivalco Inc.
c. Global Safety Products, Inc.
d. Kennedy Valve; a division of McWane, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Shurjoint Piping Products.
h. Tyco Fire & Building Products LP.
i. Victaulic Company.

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.
c. End Connections: Threaded.

5. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

2.5 HOSE CONNECTIONS

A. Nonadjustable-Valve Hose Connections:

1. Manufacturers or equal: Subject to compliance with requirements:

a. AFAC Inc.
b. Elkhart Brass Mfg. Company, Inc.
c. Fire-End & Croker Corporation.
d. Fire Protection Products, Inc.
e. GMR International Equipment Corporation.
f. Guardian Fire Equipment, Inc.
g. Kennedy Valve; a division of McWane, Inc.
h. Mueller Co.; Water Products Division.
i. NIBCO INC.
j. Potter Roemer.
k. Tyco Fire & Building Products LP.
l. Wilson & Cousins Inc.

2. Standard: UL 668 hose valve for connecting fire hose.
3. Pressure Rating: 300 psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
6. Inlet: Female pipe threads.

7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
8. Pattern: Angle or gate.
9. Finish: Rough brass or bronze.

2.6 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. AFAC Inc.
   b. Elkhart Brass Mfg. Company, Inc.
   c. GMR International Equipment Corporation.
   d. Guardian Fire Equipment, Inc.
   e. Potter Roemer.

2. Standard: UL 405.
3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Back.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
14. Finish: Polished chrome plated.
15. Outlet Size: NPS 4.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. ADT Security Services, Inc.
   b. McDonnell & Miller; ITT Industries.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.
   e. Viking Corporation.
   f. Watts Industries (Canada) Inc.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Kennedy Valve; a division of McWane, Inc.
   c. Potter Electric Signal Company.
   d. 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 controlled valve is in other than fully open position.

2.8 PRESSURE GAGES

A. Manufacturers or equal: Subject to compliance with requirements:

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. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression standpipe piping to water-service piping at service entrance into building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate 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 written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.

D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install drain valves on standpipes. Extend drain piping to outside of building.

F. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

I. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

J. Fill wet-type standpipe system piping with water.

K. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

L. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

M. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than 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 remove 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, Cut-Grooved Joints: Cut square-edge groove in end of 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 joints.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of 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.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with 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 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

3.5 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes.

B. Install freestanding hose connections for access and minimum passage restriction.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. 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 standpipe systems according to NFPA 14, "System 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 same as local fire-department equipment.

C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Wet-type, fire-suppression standpipe piping, NPS 4 and smaller, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.

C. Wet-type, fire-suppression standpipe piping, NPS 5 and NPS 6, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.

END OF SECTION 211200

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

B. Related Sections:

1. Division 21 Section "Fire-Suppression Standpipes" for standpipe piping.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria based on the sprinkler designer's flow test.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:
   a. Building Service Areas: Ordinary Hazard, Group 1.
   b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
   c. General Storage Areas: Ordinary Hazard, Group 1.
   d. Laundries: Ordinary Hazard, Group 1.
   e. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   f. Office and Public Areas: Light Hazard.

3. Minimum Density for Automatic-Sprinkler Piping Design:

a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
c. Special Occupancy Hazard: As determined by authorities having jurisdiction.

4. Maximum Protection Area per Sprinkler: Per UL listing.
5. Maximum Protection Area per Sprinkler:
   a. Office Spaces: 120 sq. ft.
   b. Storage Areas: 130 sq. ft.
   c. Mechanical Equipment Rooms: 130 sq. ft.
   d. Electrical Equipment Rooms: 130 sq. ft.
   e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

6. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

   a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
   b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and professional engineer.

B. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

C. Welding certificates.

D. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Black-Steel Pipe: ASTM A 53/A 53M, Type E. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Galvanized, Steel Couplings: ASTM A 865, threaded.

E. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME 16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Anvil International, Inc.
b. Corcoran Piping System Co.
c. National Fittings, Inc.
d. Shurjoint Piping Products.
e. Tyco Fire & Building Products LP.
f. Victaulic Company.

2. Pressure Rating: 175 psig minimum.
3. Galvanized, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
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, EPDM-rubber gasket, and bolts and nuts.

2.3 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 Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. AFAC Inc.
b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
c. Anvil International, Inc.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Crane Co.; Crane Valve Group; Stockham Division.
h. Fire-End & Croker Corporation.
i. Fire Protection Products, Inc.
j. Fivalco Inc.
k. Globe Fire Sprinkler Corporation.
l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.
n. Matco-Norca.
o. Metraflex, Inc.
p. Milwaukee Valve Company.
q. Mueller Co.; Water Products Division.
r. NIBCO INC.
s. Potter Roemer.
t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.

aa. Watts Water Technologies, Inc.

2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. United Brass Works, Inc.

2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.

5. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Crane Valves.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. Hammond Valve.
h. Milwaukee Valve Company.
i. Mueller Co.; Water Products Division.
j. NIBCO INC.
k. Shurjoint Piping Products.
l. Tyco Fire & Building Products LP.
m. United Brass Works, Inc.
n. Watts Water Technologies, Inc.

2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Anvil International, Inc.
b. Fivalco Inc.
c. Global Safety Products, Inc.
d. Kennedy Valve; a division of McWane, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Shurjoint Piping Products.
h. Tyco Fire & Building Products LP.
i. Victaulic Company.

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.
c. End Connections: Threaded.

5. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.

b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch indicating device.

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. Minimum Pressure Rating: 175 psig.

B. Ball Valves:

1. Manufacturers or equal: Subject to compliance with requirement:

a. Affiliated Distributors.
b. Anvil International, Inc.
c. Barnett.
d. Conbraco Industries, Inc.; Apollo Valves.
e. Fire-End & Croker Corporation.
f. Fire Protection Products, Inc.
g. Flowserve.
h. FNW.
i. Jomar International, Ltd.
j. Kennedy Valve; a division of McWane, Inc.
k. Kitz Corporation.
l. Legend Valve.
m. Metso Automation USA Inc.
n. Milwaukee Valve Company.
o. NIBCO INC.
p. Potter Roemer.
q. Red-White Valve Corporation.
r. Southern Manufacturing Group.
s. Stewart, M. A. and Sons Ltd.
t. Tyco Fire & Building Products LP.
u. Victaulic Company.
v. Watts Water Technologies, Inc.

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. Minimum Pressure Rating: 175 psig.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.

5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Manufacturers or equal: Subject to compliance with requiremen:

a. AFAC Inc.
b. Globe Fire Sprinkler Corporation.
c. Reliable Automatic Sprinkler Co., Inc.
d. Tyco Fire & Building Products LP.
e. Venus Fire Protection Ltd.
f. Victaulic Company.
g. Viking Corporation.

2. Standard: UL 193.
3. Design: For horizontal or vertical installation.
4. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
5. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
6. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. AFAC Inc.
b. Reliable Automatic Sprinkler Co., Inc.
c. Tyco 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 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers or equal: Subject to compliance with requirements,:

a. AFAC Inc.
b. Elkhart Brass Mfg. Company, Inc.
c. GMR International Equipment Corporation.
d. Guardian Fire Equipment, Inc.
e. Potter Roemer.

2. Standard: UL 405.

3. Type: Flush, for wall mounting.
4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Back.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
14. Finish: Polished chrome plated.
15. Outlet Size: NPS 4.

2.8 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. Shurjoint Piping Products.
   d. Tyco Fire & Building Products LP.
   e. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. AGF Manufacturing Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco 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 orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Elkhart Brass Mfg. Company, Inc.
   b. Fire-End & Croker Corporation.
   c. Potter Roemer.

2. Standard: UL 199.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. AGF Manufacturing Inc.
   b. Triple R Specialty.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. 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.

E. Adjustable Drop Nipples:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. CECA, LLC.
   b. Corcoran Piping System Co.
   c. Merit Manufacturing; a division of Anvil International, Inc.

2. Standard: UL 1474.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.

6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

2.9 SPRINKLERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. AFAC Inc.
2. Globe Fire Sprinkler Corporation.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.
6. Victaulic Company.
7. 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 Residential Sprinklers: 175 psig maximum.
3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Reliable Automatic Sprinkler Co., Inc.
    b. Tyco Fire & Building Products LP.
    c. Victaulic Company.
    d. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Globe Fire Sprinkler Corporation.
    b. Tyco Fire & Building Products LP.
    c. Victaulic Company.
    d. Viking Corporation.

2. Standard: UL 753.
3. Type: Mechanically operated, with Pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 10-inch diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4.
8. Outlet: NPS 1 drain connection.

C. Water-Flow Indicators:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. ADT Security Services, Inc.
    b. McDonnell & Miller; ITT Industries.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.
    e. Viking Corporation.
    f. Watts Industries (Canada) Inc.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.

6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Kennedy Valve; a division of McWane, Inc.
c. Potter Electric Signal Company.
d. 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 controlled valve is in other than fully open position.

2.11 PRESSURE GAGES

A. Manufacturers or equal: Subject to compliance with requirements:

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. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate 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 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 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. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

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.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire-Suppression Piping."

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than 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 remove 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. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of 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 joints.

J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of 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.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with 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, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.5 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

3.6 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.7 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. 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. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.10 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control vales, instead of specified fittings.

C. Wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be one of the following:

1. Standard-weight or Schedule 30, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight or Schedule 30, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
3. Standard-weight or Schedule 30, black-steel pipe with plain ends; steel welding fittings; and welded joints.

3.11 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers. Provide guards at gymnasium.
2. Rooms with Suspended Ceilings: Concealed sprinklers.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Pendent, dry sprinklers.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in plumbing equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves.
   b. Piping NPS 6 and Larger: Cast-iron wall sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves.

END OF SECTION 220517

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace escutcheons and floor plates damage during transport, storage and installation with new materials.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Flo Fab Inc.
b. Miljoco Corporation.
c. Palmer Wahl Instrumentation Group.
d. Tel-Tru Manufacturing Company.
e. Trerice, H. O. Co.
f. Weiss Instruments, Inc.
g. Winters Instruments - U.S.

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.

6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass.
8. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1 ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. AMETEK, Inc.; U.S. Gauge.
    b. Ashcroft Inc.
    c. Ernst Flow Industries.
    d. Flo Fab Inc.
    e. Marsh Bellofram.
    f. Miljoco Corporation.
    g. Noshok.
    h. Palmer Wahl Instrumentation Group.
    i. REOTEMP Instrument Corporation.
    j. Tel-Tru Manufacturing Company.
    k. Trerice, H. O. Co.
    l. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
    m. Weiss Instruments, Inc.

n. WIKA Instrument Corporation - USA.
o. Winters Instruments - U.S.

2. Standard: ASME B40.100.
3. Case: Sealed type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Ring: Metal.
11. Accuracy: Grade B, plus or minus 2 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids.

H. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlet and outlet of each domestic hot-water storage tank.

I. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

J. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

K. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be the following:
1. Industrial-style, liquid-in-glass type.

B. Thermometers at inlets and outlets of each domestic water heat exchanger shall be the following:
1. Industrial-style, liquid-in-glass type.

C. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be the following:
1. Industrial-style, liquid-in-glass type.

D. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

3.4 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Sealed, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall bethe following:

1. Sealed, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Sealed, direct-mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 160 psi.

B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION 220519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Bronze gate valves.
7. Iron gate valves.
8. Bronze globe valves.
9. Iron globe valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. DynaQuip Controls.
d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
e. Hammond Valve.
f. Jamesbury; a subsidiary of Metso Automation.
g. Jomar International, LTD.
h. Kitz Corporation.
i. Legend Valve.
j. Marwin Valve; a division of Richards Industries.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Red-White Valve Corporation.
n. RuB Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.

g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Crane Valves.
d. Hammond Valve.
e. Lance Valves; a division of Advanced Thermal Systems, Inc.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Cooper Cameron Valves; a division of Cooper Cameron Corporation.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Flo Fab Inc.

h. Hammond Valve.
i. Kitz Corporation.
j. Legend Valve.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International, Inc.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Kitz Corporation.
   f. Legend Valve.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Sure Flow Equipment Inc.
   l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   m. Zy-Tech Global Industries, Inc.

2. Description:

   a. Standard: MSS SP-71, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Clear or full waterway.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged.
   f. Trim: Bronze.
   g. Gasket: Asbestos free.

2.7 BRONZE GATE VALVES

A. Class 125, RS Bronze Gate Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.8 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Flo Fab Inc.
e. Hammond Valve.
f. Kitz Corporation.
g. Legend Valve.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell Valves.
k. Red-White Valve Corporation.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

2.9 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.
d. Kitz Corporation.

e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
j. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

2.10 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 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 at or above center of pipe.

D. Install valves in position to allow full stem movement.

3.2 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.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Throttling Service: Globe or ball valves.
3. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
    b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or with spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125, bronze disc.
3. Ball Valves: Two piece, full port, brass or bronze with bronze trim.
4. Bronze Swing Check Valves: Class 125, bronze disc.
5. Bronze Gate Valves: Class 125, RS.
6. Bronze Globe Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 125, metal seats.
4. Iron Gate Valves: Class 125, OS&Y.
5. Iron Globe Valves: Class 125.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.

4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

G. Use padded hangers for piping that is subject to scratching.

H. Use thermal-hanger shield inserts for insulated piping and tubing.

I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

a. Light (MSS Type 31): 750 lb.
b. Medium (MSS Type 32): 1500 lb.
c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Freestanding and restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Restraining braces and cables.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: D.
2. Seismic Design Category: C
3. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.

a. Component Importance Factor: 1.0.

1.3 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproved by ICC-ES, or preapproved by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

B. Manufacturers or equal: Subject to compliance with requirements:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

C. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

D. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central

threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

F. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

G. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

H. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel up or down before contacting a resilient collar.

I. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

J. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

K. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

L. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

M. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

B. Manufacturers or equal: Subject to compliance with requirements:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.

C. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between 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 component.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. 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 component.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during

coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 22 Section "Domestic Water Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 220548

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Red.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Water Piping:

a. Background Color: White.
b. Letter Color: Black.

2. Sanitary Waste and Storm Drainage Piping:

a. Background Color: White.
b. Letter Color: Black.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic water piping.
2. Domestic recirculating hot-water piping.
3. Roof drains and rainwater leaders.
4. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application of field-applied jackets.
6. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products or equal: Subject to compliance with requirements:

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products or equal: Subject to compliance with requirements:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products or equal: Subject to compliance with requirements:

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products or equal: Subject to compliance with requirements:

a. Aeroflex USA, Inc.; Aeroseal.
b. Armacell LLC; Armaflex 520 Adhesive.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, 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. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products or equal: Subject to compliance with requirements:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products or equal: Subject to compliance with requirements:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
    d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products or equal: Subject to compliance with requirements:

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products or equal: Subject to compliance with requirements:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
    b. Eagle Bridges - Marathon Industries; 550.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
    d. Mon-Eco Industries, Inc.; 55-50.
    e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. ASJ Flashing Sealants:

1. Products or equal: Subject to compliance with requirements:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products or equal: Subject to compliance with requirements:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
c. Tee covers.
d. Flange and union covers.
e. End caps.
f. Beveled collars.
g. Valve covers.
h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

C. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

1. Products or equal: Subject to compliance with requirements:

a. Pittsburgh Corning Corporation; Pittwrap.
b. Polyguard Products, Inc.; Insulrap No Torch 125.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products or equal: Subject to compliance with requirements:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.

d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

1. Products or equal: Subject to compliance with requirements:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping and Seals.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Engineered Brass Company.
b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
c. McGuire Manufacturing.
d. Plumberex.
e. Truebro; a brand of IPS Corporation.
f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers or equal;: Subject to compliance with requirements:

a. Truebro; a brand of IPS Corporation.
b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints,

seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.8 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Water and Recirculated Hot Water: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.

2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Stormwater and Overflow: Insulation shall be one of the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Roof Drain and Overflow Drain Bodies: Insulation shall be the following:

1. Flexible Elastomeric: 1 inch thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be one of the following:

1. Protective Shielding Pipe Covers.
2. Protective Shielding Pipe Enclosure.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water and Recirculated Hot Water Piping: Insulation shall be one of the following:
1. Flexible Elastomeric: 2 inches thick.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 2 inches thick.

3.13 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Division 33 piping distribution Sections.

3.14 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:
1. Aluminum, Smooth: 0.020 inch.

3.15 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.
C. Piping, Concealed:
   1. None.

D. Piping, Exposed:
   1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.020 inch.

3.16 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L and ASTM B 88, Type M water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Plastic-to-Metal Transition Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Charlotte Pipe and Foundry Company.
b. Harvel Plastics, Inc.
c. Spears Manufacturing Company.

2. Description:

a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Colonial Engineering, Inc.
b. NIBCO Inc.
c. Spears Manufacturing Company.

2. Description:

a. CPVC or PVC four-part union.
b. Brass threaded end.
c. Solvent-cement-joint plastic end.
d. Rubber O-ring.
e. Union nut.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Hart Industries International, Inc.

d. Jomar International.
e. Matco-Norca.
f. McDonald, A. Y. Mfg. Co.
g. Watts; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
b. Central Plastics Company.
c. Matco-Norca.
d. Watts; a division of Watts Water Technologies, Inc.
e. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 125 psig minimum at 180 deg F.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Elster Perfection Corporation.
b. Grinnell Mechanical Products; Tyco Fire Products LP.
c. Matco-Norca.
d. Precision Plumbing Products, Inc.
e. Victaulic Company.

2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Division 22 Section "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Division 22 Section "Domestic Water Piping Specialties."

G. Install domestic water piping level and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Division 22 Section "Meters and Gages for Plumbing Piping."

S. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Division 22 Section "Domestic Water Pumps."

T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Division 22 Section "Meters and Gages for Plumbing Piping."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges or flange kits.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.

3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code. Comply with requirements for connection sizes in Division 22 plumbing fixture Sections.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Division 22 Section "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials.

Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
d. Repeat procedures if biological examination shows contamination.
e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K or ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K or ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

F. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard or soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

G. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; cast- or wrought-copper, solder-joint fittings; and soldered joints.

H. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; cast- or wrought-copper, solder-joint fittings; and soldered joints.

I. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L or ASTM B 88, Type M; cast- or wrought-copper, solder-joint fittings; and soldered joints.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

B. Related Requirements:

1. Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Division 22 Section "Domestic Water Piping" for water meters.
3. Division 22 Section "Pressure Water Coolers" for water filters for water coolers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.
7. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

B. Double-Check, Backflow-Prevention Assemblies:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
5. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
6. Configuration: Designed for horizontal, straight-through flow.

7. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Cash Acme; a division of Reliance Worldwide Corporation.
    b. Conbraco Industries, Inc.
    c. Honeywell International Inc.
    d. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
    e. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.
4. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
5. Valves for Booster Heater Water Supply: Include integral bypass.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Crane Co.; Crane Valve Group; Jenkins Valves.
    d. Crane Co.; Crane Valve Group; Stockham Div.
    e. Hammond Valve.
    f. Milwaukee Valve Company.
    g. NIBCO Inc.
    h. Red-White Valve Corp.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.

8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Armstrong International, Inc.
   b. Cash Acme; a division of Reliance Worldwide Corporation.
   c. Conbraco Industries, Inc.
   d. Honeywell International Inc.
   e. Legend Valve.
   f. Leonard Valve Company.
   g. Powers; a division of Watts Water Technologies, Inc.
   h. Symmons Industries, Inc.
   i. TACO Incorporated.
   j. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
   k. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 105 deg F.
9. Tempered-Water Design Flow Rate: <Insert gpm>.
10. Valve Finish: Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Armstrong International, Inc.
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Powers; a division of Watts Water Technologies, Inc.
   e. Symmons Industries, Inc.

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.

7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 120 deg F.
9. Valve Finish: Rough bronze.
10. Piping Finish: Copper.
11. Cabinet: Factory fabricated, stainless steel, for surface mounting and with hinged, stainless-steel door.

2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.033 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
    c. Strainers NPS 5 and Larger: 0.125 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.9 HOSE BIBBS

A. Hose Bibbs (interior):

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Wheel handle.
14. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): Two with each wall hydrant.

2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. AMTROL, Inc.
    b. Josam Company.
    c. MIFAB, Inc.
    d. Precision Plumbing Products, Inc.
    e. Sioux Chief Manufacturing Company, Inc.
    f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    g. Tyler Pipe; Wade Div.
    h. Watts Drainage Products.
    i. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers or equal: Subject to compliance with requirements:

a. MIFAB, Inc.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve and pump.

F. Install water-hammer arresters in water piping according to PDI-WH 201.

G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements for ground equipment in Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Fire-retardant-treated-wood blocking is specified in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer and double-check, backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221123 - DOMESTIC WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

PART 2 - PRODUCTS

2.1 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Armstrong Pumps Inc.
2. Bell & Gossett Domestic Pump; ITT Corporation.
3. Grundfos Pumps Corp.
4. TACO Incorporated.
5. WILO USA LLC - WILO Canada Inc.

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Casing: Bronze, with threaded or companion-flange connections.
3. Impeller: Plastic.
4. Motor: Single speed, unless otherwise indicated.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 22 Section "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

2.3 CONTROLS

A. Timers: Electric, for control of hot-water circulation pump.

1. Type: Programmable, seven-day clock with manual override on-off switch.
2. Enclosure: NEMA 250, Type 1, suitable for wall mounting.
3. Operation of Pump: On or off.
4. Transformer: Provide if required.
5. Power Requirement: 120-V ac.
6. Programmable Sequence of Operation: Up to two on-off cycles each day for seven days.

PART 3 - EXECUTION

3.1 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install in-line, sealless centrifugal pumps with shaft horizontal unless otherwise indicated.

C. Install continuous-thread hanger rods and spring hangers of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Install timers on wall in mechanical room with water heater.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Section "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps to allow service and maintenance.

C. Connect domestic water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
b. Comply with requirements for flexible connectors specified in Division 22 Section "Domestic Water Piping."

2. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for valves specified in Division 22 Section "General-Duty Valves for Plumbing Piping" and comply with requirements for strainers specified in Division 22 Section "Domestic Water Piping Specialties."
3. Install pressure gage and snubber at suction of each pump and pressure gage and snubber at discharge of each pump. Install at integral pressure-gage tappings where provided or install pressure-gage connectors in suction and discharge piping around pumps. Comply with requirements for pressure gages and snubbers specified in Division 22 Section "Meters and Gages for Plumbing Piping."

D. Comply with Division 26 Sections for electrical connections, and wiring methods.

E. Connect timers to pumps that they control.

3.3 ADJUSTING

A. Adjust domestic water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. Fernco Inc.
d. Matco-Norca, Inc.
e. MIFAB, Inc.
f. Mission Rubber Company; a division of MCP Industries, Inc.
g. Stant.
h. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ANACO-Husky.
b. Clamp-All Corp.
c. Dallas Specialty & Mfg. Co.
d. MIFAB, Inc.
e. Mission Rubber Company; a division of MCP Industries, Inc.
f. Stant.
g. Tyler Pipe.

2. Standards: ASTM C 1277 and ASTM C 1540.

3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

3. Shielded, Nonpressure Transition Couplings:

    a. Manufacturers or equal: Subject to compliance with requirements,:

        1) Cascade Waterworks Mfg. Co.
        2) Mission Rubber Company; a division of MCP Industries, Inc.

    b. Standard: ASTM C 1460.
    c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

M. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Division 22 Section "Sanitary Waste Piping Specialties."
2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Sanitary Waste Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for cleanouts and drains specified in Division 22 Section "Sanitary Waste Piping Specialties."
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Aboveground, vent piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: [Unshielded] [Shielded], nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:
   1. Cleanouts.
   2. Floor drains.
   3. Trench drains.
   4. Roof flashing assemblies.
   5. Miscellaneous sanitary drainage piping specialties.
   6. Flashing materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:
   1. Manufacturers or equal: Subject to compliance with requirements:

      a. Josam Company; Josam Div.
      b. MIFAB, Inc.
      c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
      d. Tyler Pipe; Wade Div.
      e. Watts Drainage Products Inc.
      f. Zurn Plumbing Products Group; Specification Drainage Operation.

   2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
   3. Size: Same as connected drainage piping
   4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
   5. Closure: Countersunk plug.
   6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:
1. Manufacturers or equal: Subject to compliance with requirements:

a. Josam Company; Josam Div.
b. Oatey.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group; Light Commercial Operation.
h. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M for cast-iron soil pipe with cast-iron ferrule cleanout.
3. Size: Same as connected branch.
4. Type: Cast-iron soil pipe with cast-iron ferrule.
5. Body or Ferrule: Cast iron.
6. Outlet Connection: Spigot.
7. Closure: Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.

12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:
1. Manufacturers or equal: Subject to compliance with requirements:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Manufacturers or equal: Subject to compliance with requirements:

a. Commercial Enameling Co.
b. Josam Company; Josam Div.
c. MIFAB, Inc.
d. Prier Products, Inc.
e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
f. Tyler Pipe; Wade Div.
g. Watts Drainage Products Inc.
h. Zurn Plumbing Products Group; Light Commercial Operation.
i. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Required.
7. Clamping Device: Required.
8. Outlet: Bottom.
9. Top or Strainer Material: Nickel bronze.
10. Top of Body and Strainer Finish: Nickel bronze.
11. Top Shape: Round.
12. Top Loading Classification: Heavy Duty.
13. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
14. Trap Material: Cast iron.
15. Trap Pattern: Standard P-trap.
16. Trap Features: Cleanout and trap-seal primer valve drain connection.

2.3 TRENCH DRAINS

A. Polypropylene Floor Drains:
1. Manufacturers or equal: Subject to compliance with requirements:
a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Watts Drainage Products Inc.
e. Zurn Plumbing Products Group; Light Commercial Operation.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.3.
3. Pattern: Surface drain.
4. Body Material: Polypropylene (post industrial recycled material).
5. Seepage Flange: Required.
6. Clamping Device: Integral rebar support.
7. Outlet: End.
8. Top Material (grate): To be selected by the architect. No steel or cast-iron grates.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies :

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 6.0-lb/sq. ft., 0.0938-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting. Coordinate with Roofing Specification Section

1. Open-Top Vent Cap: Without cap.

2.5 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch- minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and

galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Assemble open drain fittings and install with top of hub 2 inches above floor.

F. Install deep-seal traps on floor drains and other waste outlets, if indicated.

G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

J. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221413 - FACILITY STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

B. Related Section:

1. Division 33 Section "Storm Utility Drainage Piping" for storm drainage piping outside the building.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Storm drainage piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For storm drainage piping, accessories, and components, from manufacturer.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ANACO-Husky.
b. Dallas Specialty & Mfg. Co.
c. Fernco Inc.
d. Matco-Norca, Inc.
e. MIFAB, Inc.
f. Mission Rubber Company; a division of MCP Industries, Inc.
g. Stant.
h. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

a. Manufacturers or equal: Subject to compliance with requirements:

1) Dallas Specialty & Mfg. Co.
2) Fernco Inc.
3) Mission Rubber Company; a division of MCP Industries, Inc.
4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

b. Standard: ASTM C 1173.
c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

a. Manufacturers or equal: Subject to compliance with requirements:

1) Cascade Waterworks Mfg. Co.
2) Mission Rubber Company; a division of MCP Industries, Inc.

b. Standard: ASTM C 1460.
c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

I. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install storm drainage piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.

L. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

M. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping. Comply with requirements for cleanouts specified in Division 22 Section "Storm Drainage Piping Specialties."
2. Install drains in storm drainage gravity-flow piping. Comply with requirements for drains specified in Division 22 Section "Storm Drainage Piping Specialties."

N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
4. Vertical Piping: MSS Type 8 or Type 42, clamps.
5. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
7. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Comply with requirements for cleanouts and drains specified in Division 22 Section "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.
4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger shall be any o] the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221413

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.
4. Flashing materials.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Medium-Sump, Combination Main Roof & Overflow Drain:

1. Basis of Design or equal: Zurn Z164. Equal by Jay R. Smith or prior to bid equals.
2. Body Material: Cast iron.
3. Dimension of Body: 12-inch diameter.
4. Combination Flashing Ring and Gravel Stop: Required.
5. Flow-Control Weirs: Required.
6. Outlet: Bottom.
7. Extension Collars: Required.
8. Underdeck Clamp: Required.
9. Dome Material: Cast-Iron.
10. Wire Mesh: Not required.
11. Water Dam: 2 inches high required at overflow roof drains only.

2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adaptors:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout and NPS 4 outlet.

C. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

2.3 CLEANOUTS

A. Test Tees:

1. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
2. Size: Same as connected drainage piping.
3. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
4. Closure Plug: Countersunk, brass.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Wall Cleanouts:

1. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
2. Size: Same as connected drainage piping.
3. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch as required to match connected piping.
4. Closure: Countersunk, brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.4 FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft..

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 07 Sections.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 12 inches above grade. Secure to building wall.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

E. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

F. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

G. Install test tees in vertical conductors and near floor.

H. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

I. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Crane Plumbing, L.L.C.
d. Ferguson Enterprises, Inc.; ProFlo Brand.
e. Gerber Plumbing Fixtures LLC.
f. Kohler Co.
g. Mansfield Plumbing Products LLC.
h. TOTO USA, INC.
i. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.

c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard.
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.
i. Color: White

3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.

B. Water Closets: Floor mounted, bottom outlet, top spud. ADA Compliant.

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Crane Plumbing, L.L.C.
d. Ferguson Enterprises, Inc.; ProFlo Brand.
e. Gerber Plumbing Fixtures LLC.
f. Kohler Co.
g. Mansfield Plumbing Products LLC.
h. TOTO USA, INC.
i. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Handicapped/elderly, complying with ICC/ANSI A117.1.
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.
i. Color: White

3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.

2.2 FLUSHOMETER VALVES

A. Solenoid-Actuator, Diaphragm Flushometer Valves with Sensor:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Coyne & Delany Co.
b. Gerber Plumbing Fixtures LLC.
c. Sloan Valve Company.
d. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASSE 1037.

3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
10. Trip Mechanism: Hard-wired, electronic sensor complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application. Sensor and power converter (to power up to 8 flush valves) to be installed by the plumbing contractor or coordinate installation with the electrical contractor.
11. Consumption: 1.28 gal. per flush.
12. Minimum Inlet: NPS 1.
13. Minimum Outlet: NPS 1-1/4.

2.3 TOILET SEATS

A. Toilet Seats:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. American Standard America.
   b. Bemis Manufacturing Company.
   c. Centoco Manufacturing Corporation.
   d. Church Seats.
   e. Jones Stephens Corp.; Comfort Seat Brand.
   f. Kohler Co.
   g. Olsonite Seat Co.
   h. Sanderson Plumbing Products, Inc.
   i. Sperzel of Lexington.
   j. TOTO USA, INC.
   k. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: IAPMO/ANSI Z124.5.
3. Material: Plastic.
4. Type: Commercial (Standard).
5. Shape: Elongated rim, open front.
6. Hinge: Self-sustaining, check.
7. Hinge Material: Noncorroding metal.
8. Color: White.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
4. Install actuators in locations that are easy for people with disabilities to reach.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.3 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.4 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

SECTION 224213.16 - COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

A. Urinals : Wall hung, back outlet, siphon jet, accessible.

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Ferguson Enterprises, Inc.; ProFlo Brand.
d. Gerber Plumbing Fixtures LLC.
e. Kohler Co.
f. Mansfield Plumbing Products LLC.

2. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet with extended shields.
d. Strainer or Trapway: Manufacturer's standard with integral trap.
e. Water Consumption: Low.
f. Spud Size and Location: NPS 3/4; top.

g. Outlet Size and Location: NPS 2; back.
h. Color: White.

3. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.

4. Support: ASME A112.6.1M, Type I, urinal carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. Include rectangular, steel uprights.

2.2 URINAL FLUSHOMETER VALVES

A. Solenoid-Actuator, Diaphragm Flushometer Valves with Sensor:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Coyne & Delany Co.
b. Gerber Plumbing Fixtures LLC.
c. Sloan Valve Company.
d. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Style: Exposed.
8. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
9. Trip Mechanism: Hard-wired, electronic sensor complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application. Sensor and power converter (to power up to 8 flush valves) to be installed by the plumbing contractor or coordinate installation with the electrical contractor.
10. Consumption: 0.5 gal. per flush.
11. Minimum Inlet: NPS 3/4.
12. Minimum Outlet: NPS 3/4.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

1. Install urinals level and plumb according to roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for wall-hung urinals.
2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
3. Use carriers without waste fitting for urinals with tubular waste piping.
4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

1. Install flushometer-valve water-supply fitting on each supply to each urinal.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Basis-of-Design Product or equal: Subject to compliance with requirements, provide Zurn Z5340 or equal:

a. American Standard America.
b. Briggs Plumbing Products, Inc.
c. Crane Plumbing, L.L.C.

d. Ferguson Enterprises, Inc.; ProFlo Brand.
e. Gerber Plumbing Fixtures LLC.
f. Kohler Co.
g. Mansfield Plumbing Products LLC.
h. Peerless Pottery Sales, Inc.
i. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Nominal Size: Oval, 20 by 18 inches.
d. Faucet-Hole Punching: One hole.
e. Faucet-Hole Location: Top.
f. Color: White.
g. Mounting Material: Chair carrier.

3. Faucet: See Faucet article.
4. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.2 CERAMIC, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Basis-of-Design Product or equal: Subject to compliance with requirements, provide EKO EKOIS-Com Incline Countersink or equal.

2. Fixture:
a. Type: For wall hanging.
b. Nominal Size: See architectural drawings and plumbing schedule dimensions.
c. Faucet-Hole Punching: Two (2) per lavatory up to 80" in length; three (3) per lavatory over 80" in length – see architectural drawings and plumbing schedule.
d. Faucet-Hole Location: Top.
e. Color: White.

3. Faucet: See Faucet article.
4. Support: Provide manufacture's standard carrier support system.

2.3 SOLID-BRASS, SENSOR OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Sensor-type, solid-brass valve.
1. Basis-of-Design Product or equal: Subject to compliance with requirements, provide Zurn Z6930-XL or equal:

a. American Standard America.
b. Bradley Corporation.

c. Chicago Faucets.
d. Delta Faucet Company.
e. Elkay Manufacturing Co.
f. Grohe America, Inc.
g. Just Manufacturing.
h. Kohler Co.
i. Moen Incorporated.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Coordinate faucet inlets with supplies and fixture hole punching; coordinate outlet with spout and fixture receptor.
4. Body Type: Single hole.
5. Body Material: Commercial, solid brass.
6. Finish: Polished chrome plate.
7. Maximum Flow Rate: 0.5 gpm
8. Mounting Type: Deck, exposed.
9. Spout: Rigid type.
10. Spout Outlet: Aerator.
11. Occupant Detection: infrared convergence-type proximity sensor.
12. Thermostatic Mixing Valve: Required.
13. Accessories:
    a. Connector wire for hardwire installation
    b. Mini junction box
    c. Power converter

2.4 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

1. NPS 3/8.
2. Chrome-plated, soft-copper flexible tube riser.

2.5 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

1. Size: NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories and counters and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Division 22 Section "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Utility sinks.
2. Service basins
3. Sink faucets.
4. Laminar-flow, faucet-spout outlets.
5. Supply fittings.
6. Waste fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

PART 2 - PRODUCTS

2.1 UTILITY SINKS

A. Utility Sinks: Double bowl, Stainless steel, counter mounted.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Advance Tabco.
b. Eagle Group; Foodservice Equipment Division.
c. Elkay Manufacturing Co.
d. Griffin Products, Inc.
e. Just Manufacturing.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.

b. Type: Ledge back.
c. Number of Compartments: Two.
d. Overall Dimensions: ADA compliant compartment depth. See architectural drawings and coordinate with the millwork contractor.
e. Metal Thickness: 0.050 inch.
f. Compartments:
1) Drain: NPS 1-1/2 tailpiece with stopper.
2) Drain Location: Centered in compartment.

3. Faucet(s):

a. Number Required: One.
b. Mounting: On ledge.

4. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, chrome-plated, soft-copper flexible tube.

5. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap(s):

1) Size: NPS 1-1/2.
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated brass or steel wall flange.
3) Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

c. Continuous Waste:

1) Size: NPS 1-1/2.
2) Material: Chrome-plated, 0.032-inch- thick brass tube.

6. Mounting: On sink deck.

7. Faucet: See Utility Sink Faucet article.

B. Utility Sinks: Single bowl, Stainless steel, counter mounted.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Advance Tabco.
b. Eagle Group; Foodservice Equipment Division.
c. Elkay Manufacturing Co.
d. Griffin Products, Inc.

e. Just Manufacturing.

2. Fixture:

a. Standard: ASME A112.19.3/CSA B45.4.
b. Type: Ledge back.
c. Number of Compartments: One.
d. Overall Dimensions: ADA compliant compartment depth. See architectural drawings and coordinate with the millwork contractor.
e. Metal Thickness: 0.050 inch.
f. Compartments:
1) Drain: NPS 1-1/2 tailpiece with stopper.
2) Drain Location: Centered in compartment.

3. Faucet(s):

a. Number Required: One.
b. Mounting: On ledge.

4. Supply Fittings:

a. Standard: ASME A112.18.1/CSA B125.1.
b. Supplies: Chrome-plated brass compression stop with inlet connection matching water-supply piping type and size.

1) Operation: Wheel handle.
2) Risers: NPS 1/2, chrome-plated, soft-copper flexible tube.

5. Waste Fittings:

a. Standard: ASME A112.18.2/CSA B125.2.
b. Trap:

1) Size: NPS 1-1/2.
2) Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated brass or steel wall flange.
3) Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

6. Mounting: On sink deck.

7. Faucet: See Utility Sink Faucet article.

2.2 SERVICE BASINS

A. Service Basins : Terrazzo , floor mounted.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Crane Plumbing, L.L.C.

b. Ferguson Enterprises, Inc.; ProFlo Brand.
c. Fiat Products
d. Florestone Products Co., Inc.

2. Fixture or equal:

a. Standard: IAPMO/ANSI Z124.6.
b. Material: Terrazzo.
c. Nominal Size: 24 by 24 by 12 inches.
d. Tiling Flange: On one side.
e. Rim Guard: On all top surfaces.
f. Color: Gray.
g. Drain: Grid with NPS 3 outlet.
h. Wall guards: Stainless Steel, two sides.

3. Mounting: On floor and flush to wall.
4. Faucet: See Service Basin Faucet article.

2.3 UTILITY SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, single-control mixing valve.

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Standard America.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Elkay Manufacturing Co.
f. GROHE America, Inc.
g. Just Manufacturing.
h. Kohler Co.
i. Moen Incorporated.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Widespread.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 1.5 gpm.
8. Handle(s): Lever.
9. Mounting Type: Deck, exposed.
10. Spout Type: Swing, shaped tube.

11. Spout Outlet: Aerator.

2.4 SERVICE BASIN FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, two-lever-handle mixing valve.

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Standard America.
b. Bradley Corporation.
c. Chicago Faucets.
d. Delta Faucet Company.
e. Elkay Manufacturing Co.
f. GROHE America, Inc.
g. Just Manufacturing.
h. Kohler Co.
i. Moen Incorporated.
j. Speakman Company.
k. T & S Brass and Bronze Works, Inc.
l. Zurn Industries, LLC; Commercial Brass and Fixtures.

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
4. Body Type: Widespread.
5. Body Material: Commercial, solid brass.
6. Finish: Chrome plated.
7. Maximum Flow Rate: 2.2 gpm .
8. Handle(s): Lever blade, 4 inches .
9. Mounting Type: Back/wall, exposed.
10. Spout Type: Swing, solid brass with wall brace.
11. Vacuum Breaker: Required for hose outlet.
12. Spout Outlet: Laminar flow and Hose thread according to ASME B1.20.7.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-hung sinks.

C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to ICC/ANSI A117.1.

D. Set floor-mounted sinks in leveling bed of cement grout.

E. Install water-supply piping with stop on each supply to each sink faucet.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
2. Install stops in locations where they can be easily reached for operation.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

H. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Division 22 Section "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16

SECTION 224716 - PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes pressure water coolers and related components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of pressure water cooler.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For pressure water coolers to include in maintenance manuals.

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. Filter Cartridges: Two (2) for each type and size indicated.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Pressure Water Coolers: Wall mounted, wheelchair accessible.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Elkay Manufacturing Co.
b. Halsey Taylor.
c. Haws Corporation.
d. Larco Inc.
e. Tri Palm International, LLC; Oasis Brand.

2. Cabinet: Bi-level with two attached cabinets, vinyl-covered steel with stainless-steel top.
3. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
4. Control: Push bar.
5. Drain: Grid with NPS 1-1/4 tailpiece.

6. Supply: NPS 3/8 with shutoff valve.
7. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
8. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
9. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

    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.

10. Capacities and Characteristics:

    a. Cooled Water: 8 gph.
    b. Ambient-Air Temperature: 90 deg F.
    c. Inlet-Water Temperature: 80 deg F.
    d. Cooled-Water Temperature: 50 deg F.

11. Support: ASME A112.6.1M, Type I water-cooler carrier.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.

B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Division 22 Section "Escutcheons for Plumbing Piping."

F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Division 22 Section "Domestic Water Piping."

C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Comply with valve requirements specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Division 22 Section "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224716

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type.
j. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 230518

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Fastener systems.
4. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

C. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated-steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.5 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

I. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

J. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
   b. NPS 4: 12 inches long and 0.06 inch thick.

5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Freestanding and restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Restraining braces and cables.

1.2 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:
1. Building Classification Category: II.
2. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

A. Seismic-Restraint Loading:
1. Site Class as Defined in the IBC: D.
2. Seismic Design Category: C
3. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.

a. Component Importance Factor: 1.0.

1.3 ACTION SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

B. Manufacturers or equal: Subject to compliance with requirements:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

C. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

D. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated

top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

F. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

G. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment and authorities having jurisdiction.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

H. Housed Spring Mount>: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.

2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel up or down before contacting a resilient collar.

I. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

J. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

K. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.2 SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers or equal: Subject to compliance with requirements:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.

C. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an evaluation service member of ICC-ES or an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Division 07 Section "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
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 component.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. 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 component.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

G. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation

END OF SECTION 230548

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.

1.2 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Red.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Refrigerant Piping:

    a. Background Color: White.
    b. Letter Color: Blue.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums used for return air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and "Nonmetal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

K. Examine operating safety interlocks and controls on HVAC equipment.

L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Isolating and balancing valves are open and control valves are operational.
6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.

d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Division 23 Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.9 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.

3.10 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems'

balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:
1. Fan curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.

b. Conditions of filters.
c. Cooling coil, wet- and dry-bulb conditions.
d. Fan drive settings including settings and percentage of maximum pitch diameter.
e. Settings for supply-air, static-pressure controller.
f. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Position of balancing devices.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Related Sections:
1. Division 23 Section "HVAC Piping Insulation."
2. Division 23 Section "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties, and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products or equal: Subject to compliance with requirements:

    a. CertainTeed Corp.; SoftTouch Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Friendly Feel Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; SOFTR All-Service Duct Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products or equal: Subject to compliance with requirements:

    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products or equal: Subject to compliance with requirements:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products or equal: Subject to compliance with requirements:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products or equal: Subject to compliance with requirements:

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products or equal: Subject to compliance with requirements:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
    b. Eagle Bridges - Marathon Industries; 550.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
    d. Mon-Eco Industries, Inc.; 55-50.
    e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products or equal: Subject to compliance with requirements:

    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
    b. Eagle Bridges - Marathon Industries; 405.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
    d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products or equal: Subject to compliance with requirements:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products or equal: Subject to compliance with requirements:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products or equal: Subject to compliance with requirements:

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products or equal: Subject to compliance with requirements:

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products or equal: Subject to compliance with requirements:

a. ABI, Ideal Tape Division; 488 AWF.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

1. Products or equal: Subject to compliance with requirements:

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Products or equal: Subject to compliance with requirements.

1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
2) GEMCO; Perforated Base.
3) Midwest Fasteners, Inc.; Spindle.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
c. Spindle: Copper- or zinc-coated, low-carbon steel and Aluminum (corrosive areas), fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel and aluminum (corrosive areas) sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. Products or equal: Subject to compliance with requirements.

1) AGM Industries, Inc.; RC-150.
2) GEMCO; R-150.
3) Midwest Fasteners, Inc.; WA-150.
4) Nelson Stud Welding; Speed Clips.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.10 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.6 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
6. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.9 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Concealed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

E. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

F. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

G. Exposed, Outdoor-Air Duct and Plenum Insulation: Mineral-fiber blanket, 2 inches thick and 1.5-lb/cu. ft. nominal density.

H. Exposed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

3.10 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums, Concealed:

1. None.

D. Ducts and Plenums, Exposed:
1. Aluminum, Smooth: 0.024 inch.

END OF SECTION 230713

SECTION 23 08 00 – MECHANICAL SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 23 responsibilities in the commissioning process.

B. The systems to be commissioned are listed in Section 019113.

C. Commissioning requires the participation of Division 23 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Division 01. Division 23 shall be familiar with all parts of Division 26 and the commissioning plan issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Mechanical, Controls and Testing, Adjusting & Balancing (TAB) Contractors.

The commissioning responsibilities applicable to each of the mechanical, controls and TAB contractors of Division 23 are as follows (all references apply to commissioned equipment only):

Construction and Acceptance Phases

1. Include the cost of commissioning in the contract price (do NOT include the cost of the Commissioning Authority as they are under contract to the Owner).
2. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training requirements.
3. Attend a pre-commissioning meeting and other meetings necessary to facilitate the Cx process. Meetings regarding the Commissioning Process that may be required throughout the construction period will be scheduled as agenda items at the General Contractor's regularly scheduled construction coordination meetings. An exception to this policy would be extraordinary meetings which are deemed necessary by the CA and the General Contractor with necessary parties attending in order to resolve outstanding deficiencies toward the end of the construction period.
4. Contractors shall provide the CA with normal cut sheets and shop drawing submittals of commissioned equipment in print and digital PDF format.
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
    b. The Commissioning Agent may request further documentation necessary for the commissioning process.

c. This data request may be made prior to normal submittals.

6. Provide a copy of the O&M manuals and submittals of commissioned equipment, through normal channels, to the CA for review and approval. O&M manuals shall be provided in print and digital PDF format.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide limited assistance to the CA in preparing the specific functional performance test procedures for the *Commissioning Plan – Construction Phase*. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
9. Assist the CA in completion of the prefunctional checklists, in particular execute the mechanical-related start-up and check-out portions of the prefunctional checklists for all commissioned equipment.
10. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
11. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
12. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that the technicians are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
13. Provide skilled technicians to perform functional performance testing under the direction of the CA for specified equipment in the *Commissioning Plan* and Section 019113. Assist the CA in interpreting the monitoring data, as necessary.
14. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, PM and A/E and retest the equipment.
15. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
16. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing).
17. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
18. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. If specified, execute seasonal or deferred manual functional performance testing, witnessed by the CA, according to the specifications.
2. Provide assistance to the CA as required to configure the Cx-PMOR performance monitoring system.
3. Correct deficiencies according to the contract warranty process and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing or through the Cx-PMOR system.

B. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.
2. Assist and cooperate with the TAB contractor and CA by:

    a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
    b. Including cost of sheaves and belts that may be required by TAB.
    c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing.
        i. Provide factory fabricated, airtight, and non-corrosive test ports with screw cap and gasket equal to Ventlok type 699 at all locations where TAB Contractor shall make temperature, pressure, or velocity measurements. For duct which is externally insulated provide Ventlok type 699-2 which are 2-5/8" long. Mechanical Contractor shall coordinate location and quantity of TAB test ports with TAB Contractor.
        ii. The TAB team shall permanently mark and identify the location points of the duct test ports with computer generated (DYMO type) labels. If the ducts have exterior insulation, these markings shall be made on the exterior side of the duct insulation. All test port locations shall be labeled corresponding to final TAB report.
    d. Providing pressure and / or temperature testing taps / ports (a.k.a. P/T ports) according to the Construction Documents to facilitate TAB and commissioning testing or as required based on specified testing procedures.
3. Install a P/T test port at each water sensor which is an input point to the control system. P/T ports shall be located within six inches of the control system sensor. P/T ports installed on insulated piping shall be of the extended length type such that the port's threaded cap clears the specified insulation thickness.
4. List and clearly identify on the as-built drawings the locations of all air-flow stations.
5. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CA. Update the schedule as appropriate.
6. Notify the PM or CA depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the PM or CA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CA has the scheduling information needed to efficiently execute the commissioning process.

C. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (A) are:

1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. Submittals shall be provided to the CA in print and digital PDF format, they shall include:
    a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
    b. All interactions and interlocks with other systems.

c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
e. Start-up sequences.
f. Warm-up mode sequences.
g. Normal operating mode sequences.
h. Unoccupied mode sequences.
i. Shutdown sequences.
j. Capacity control sequences and equipment staging.
k. Temperature and pressure control: setbacks, setups, resets, etc.
l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
m. Effects of power or equipment failure with all standby component functions.
n. Sequences for all alarms and emergency shut downs.
o. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
p. Schedules, if known.
q. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.

2. Control Drawings Submittal
Submittals shall be provided to the CA in print and digital PDF format, they shall include:
a. The control drawings shall have a key to all abbreviations.
b. The control drawings shall contain graphic schematic depictions of the systems and each component.
c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
d. Provide a full points list with at least the following included for each point:
    1) Controlled system
    2) Point abbreviation
    3) Point description
    4) Display unit
    5) Control point or setpoint (Yes / No)
    6) Monitoring point (Yes / No)
    7) Intermediate point (Yes / No)
    8) Calculated point (Yes / No)

    Key:
    Point Description: DB temp, airflow, etc.
    Control or Setpoint: Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)
    Intermediate Point: Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

Monitoring Point: Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
Calculated Point: "Virtual" point generated from calculations of other point values.

The Controls Contractor shall keep the CA informed of all changes to this list during programming and setup.

3. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

4. Assist and cooperate with the TAB contractor in the following manner:

   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
   b. For a given area, have all required prefunctional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CA prior to TAB.
   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

5. Assist and cooperate with the CA in the following manner:

   a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system as specified for the controls contractor in the *Commissioning Plan – Construction Phase*. Assist in the functional testing of all equipment specified in the *Commissioning Plan – Construction Phase*.
   b. Execute all control system trend logs specified in the *Commissioning Plan* or as requested by the CA.

6. Provide the signed and completed DDC Test Readiness Checklist document upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system. CC shall verify with this Checklist that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.

7. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as required to implement the full sequence of control as specified in the Contract Documents.

8. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

9. System Data Trending & Reporting Detailed Requirements. The Controls Contractor for this project shall provide automated data reporting through the building automation system which shall deliver system operating data and utility consumption data (if available) daily to the PMOR system via trend reports which

are automatically emailed to the PMOR system. The complete cost for the Controls Contractor to set up ALL required trending and reporting shall be included in the project contract cost (also see Section 019113, 3.6).

a. Trend reports shall be emailed to the PMOR server on a daily basis between 12am and 6am.
b. The duration of each trend report shall include at least the entire previous day's (e.g. midnight to midnight) data. Optionally, the report could be required to include the previous three days' data so that 1-2 days of missing reports could be made up by the subsequent report. The reports shall NEVER include more than a maximum five days data. The CA shall provide direction as to the desired duration.
c. All required system operating data trends shall report the instantaneous value of the data point being trended at 15-minute intervals unless specifically directed otherwise by the CA. The trend sampling interval for each data point must be consistent, e.g. data cannot start at a five-minute interval and then change to a fifteen-minute interval.
d. All utility consumption data (kWh, ton-hr, btu, etc.) trends shall report the accumulated consumption across the interval period (e.g. electrical consumption, kWh, total for the 15-minute period) and shall not report total accumulating consumption. Demand shall be calculated as a virtual point by the PMOR analysis system.
e. The Contractor shall submit their proposed trending file format to the CA for approval prior to implementing for all requested trend points (CSV or XLS files are preferred format however PDF may also be acceptable). Once approved and set up the trend file formatting shall NOT change from one report to the next. If trend formatting changes due to software upgrade then the Contractor shall be required to compensate CA for any changes required to the PMOR system configuration to accept the new data formatting.
f. The following data point naming convention shall be utilized for all trend reports and for the subject line of emails delivering the automated report:
   < building name >.< system name >.<point name>
   All data point names must be unique from other points in the same project.
g. Minimum Required Monitoring Points:
   i. The final list of points to be monitored will be furnished by CA to the Controls Contractor after the building automation system submittal has been reviewed.
   ii. A formal trend request document will be provided to the Controls Contractor with the monitored points list and this same document shall be completed and returned to the CA as proof that set-up has been completed.
   iii. Example of Monitored Points by System Type:
      1. Variable Air Volume Air Handling Units
         Outside Air Setpoint, cfm
         Outside Air Flow, cfm
         Mixed Air Temperature, deg F
         Return Air Temperature, deg F
         Supply Air Temperature, deg F
         Chilled Water Control Valve, %OPEN
         Heating Water Control Valve, %OPEN

Supply Fan Speed, %
Static Pressure Setpoint, " w.c.
Static Pressure, " w.c.

2. Variable Volume Terminal Units
   Airflow, cfm
   Airflow Required, cfm
   Space Temperature, deg F
   Discharge Air Temperature, deg F
   Effective Temp Setpoint, deg F
   Cooling Loop Output, %
   Heating Loop Output, %
   Primary Air Damper, %OPEN
3. Chilled Water Plant
   Cooling Load, tons
   Chiller Operating Capacity, %
   Chiller CHW EWT, deg F
   Chiller CHW LWT, deg F
   Plant Bypass Valve, %OPEN (to plant)
   Building Supply Temperature, deg F
   Building Return Temperature, deg F
   Building Chilled Water Flow, gpm
   Plant Supply Temperature, deg F
   Plant Return Temperature, deg F
   Plant Chilled Water Flow, gpm
   CH Supply Setpoint, deg F

D. Testing, Adjusting & Balancing (TAB) Contractor. The duties of the TAB contractor, in addition to those listed in (A) are:

1. Six weeks prior to starting TAB, submit to the PM the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician's qualifications for this project.
2. Submit the outline of the TAB plan and approach for each system and component to the CA, PM and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:
   a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
   b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
   c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
   d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
   e. Final test report forms to be used.
   f. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

g. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
h. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
i. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
j. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
k. Details of how building static and exhaust fan / relief damper capacity will be checked.
l. Details of methods for making any specified coil or other system plant capacity measurements.
m. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
n. Details regarding specified deferred or seasonal TAB work.
o. Details of any specified false loading of systems to complete TAB work.
p. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
q. Details of any required interstitial cavity differential pressure measurements and calculations.
r. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
s. Plan for formal progress reports (scope and frequency).
t. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CA and PM at least twice a week.
5. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
7. Provide a final TAB report for the CA with details, as in the draft.
8. Conduct functional performance tests and checks (a.k.a. 'Tab Verification Process) on the original TAB. Tab Verification shall consist of repeating measurements made during the original TAB procedures and comparing results against that of the submitted TAB report as well as the design parameters.

E. Mechanical Designer. Refer to Section 019113 for the responsibilities of the mechanical designer.

1.3 RELATED WORK

A. Refer to Section 019113, Part 1.4 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 019113 Part 1.7 for systems to be commissioned and section 019113 and the Commissioning Plan – Construction Phase for functional testing requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 23 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 019113 Part 2.1 for additional Division 23 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 23 shall provide submittal documentation relative to commissioning as required in this Section Part 1 and Section 019113.

3.2 STARTUP

A. The HVAC mechanical and controls contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 019113. Division 23 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CA and CM. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 TAB

A. Refer to the TAB responsibilities in Part 1.2 above.

3.4 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 019113 Part 1.7 for a list of systems to be commissioned and to Part 3.6 for a description of the process and to the *Commissioning Plan – Construction Phase* for specific details on the required functional performance tests.

3.5 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 019113 Part 3.4 for specific details on non-conformance issues relating to prefunctional checklists and tests.

B. Refer to Section 019113 Part 3.7 for issues relating to functional performance tests.

3.6 OPERATION AND MAINTENANCE (O&M) MANUALS

A. The following O&M manual requirements do not replace O&M manual documentation requirements elsewhere in these specifications.

B. Division 23 shall compile and prepare documentation for all equipment and systems covered in Division 23 and deliver this documentation to the General Contractor for inclusion in the O&M manuals, according to this section prior to the training of owner personnel.

C. The CA shall receive a copy of the final compiled O&M manuals for review.

D. Special Control System O&M Manual Requirements. In addition to documentation that may be specified elsewhere, the controls contractor shall compile and organize at minimum the following data on the control system in labeled 3-ring binders with indexed tabs.

1. Three copies of the controls training manuals in a separate manual from the O&M manuals.
2. Operation and Maintenance Manuals containing:

    a. Specific instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. These instructions shall be step-by-step. Indexes and clear tables of contents shall be included. The detailed technical manual for programming and customizing control loops and algorithms shall be included.
    b. Full as-built set of control drawings (refer to Submittal section above for details).
    c. Full as-built sequence of operations for each piece of equipment.
    d. Full points list. In addition to the updated points list required in the original submittals (Part 1 of this section), a listing of all rooms shall be provided with the following information for each room:
        1) Floor
        2) Room number
        3) Room name
        4) Air handler unit ID
        5) Reference drawing number
        6) Air terminal unit tag ID
        7) Heating and/or cooling valve tag ID
        8) Minimum cfm
        9) Maximum cfm

    e. Full print out of all schedules and set points after testing and acceptance of the system.

f. Full as-built print out of software program.
g. Electronic copy on disk of the entire program for this facility.
h. Marking of all system sensors and thermostats on the as-built floor plan and mechanical drawings with their control system designations.
i. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
j. Control equipment component submittals, parts lists, etc.
k. Warranty requirements.
l. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).

3. The manual shall be organized and subdivided with permanently labeled tabs for each of the following data in the given order:
   a. Sequences of operation
   b. Control drawings
   c. Points lists
   d. Controller / module data
   e. Thermostats and timers
   f. Sensors and DP switches
   g. Valves and valve actuators
   h. Dampers and damper actuators
   i. Program setups (software program printouts)

4. Field checkout sheets and trend logs should be provided to the CA for inclusion in the Commissioning Record Book.

E. Special TAB Documentation Requirements. The TAB will compile and submit the following with other documentation that may be specified elsewhere in the *Specifications.*

1. Final report containing an explanation of the methodology, assumptions, test conditions and the results in a clear format with designations of all uncommon abbreviations and column headings.

F. Review and Approvals. Review of the commissioning related sections of the O&M manuals shall be made by the A/E and by the CA. Refer to Section 019113, Part 3.8 for details.

3.7. TRAINING OF OWNER PERSONNEL

A. The CM shall coordinate with the Owner for desired training sequencing and scheduling and shall provide the approved schedule of training to the Owner and CA for review and approval. The Mechanical Contractor, Controls Contractor, Electrical Contractor, and Equipment Suppliers shall complete all training activities and documentation as directed by the CM, the approved schedule, and the specific equipment specification sections.

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SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems, and equipment.

B. See Division 23 Section "Instrumentation and Control for HVAC" for control equipment and devices and for submittal requirements.

C. See Division 23 Section for individual equipment specifications for additional control information.

1.2 HEATING CONTROL SEQUENCES

1.3 AIR-HANDLING-UNIT CONTROL SEQUENCES

A. Start and Stop Supply Fan(s):

1. Enable: Freeze Protection:

a. Input Device: Duct-mounted averaging element thermostat, located before supply fan.
b. Output Device: Hard wired through motor starter; DDC system alarm.
c. Action: Allow start if duct temperature is above 37 deg F; signal alarm if fan fails to start as commanded.

2. Enable: High-Temperature Protection:

a. Input Device: Duct-mounted thermostat, located in return air.
b. Output Device: Hard wired through motor starter; DDC system alarm.
c. Action: Allow start if duct temperature is below 300 deg F.

3. Enable: Smoke Control:

a. Input Device: Duct-mounted smoke detector, located in return and supply air.
b. Output Device: Hard wired through motor starter; DDC system alarm.
c. Action: Allow start if duct is free of products of combustion.

4. Initiate: Occupied Time Schedule:

a. Input Device: DDC system time schedule.
b. Output Device: Binary output to motor starter.
c. Action: Energize fan(s).

5. Initiate: Unoccupied Time Schedule:

a. Input Device: DDC system demand.
b. Output Device: Binary output to motor starter.
c. Action: Energize fan(s).

6. Unoccupied Ventilation:

a. Input Device: DDC system time schedule and output.
b. Output Device: DDC system binary output to motor starter.
c. Action: Cycle fan(s) during unoccupied periods.

7. Display: Supply-fan on-off indication.

B. Start and Stop Return Fan(s):

1. Initiate: Occupied Time Schedule:

a. Input Device: DDC system time schedule.
b. Output Device: Binary output to motor starter.
c. Action: Energize fans when supply fans are energized.

2. Initiate: Unoccupied Time Schedule:

a. Input Device: DDC system demand.
b. Output Device: Binary output to motor starter.
c. Action: Energize fans when supply fans are energized.

3. Unoccupied Ventilation:

a. Input Device: DDC system time schedule and output.
b. Output Device: DDC system binary output to motor starter.
c. Action: Cycle fan(s) during unoccupied periods.

4. Display: Return-fan on-off indication.

C. Outside-Air Control:

1. Occupied Time Schedule:

a. Input Device: DDC system time schedule.
b. Output Device: DDC system output.
c. Action: Enable control.

2. Mixed-Air Temperature:

a. Input Device: Electronic temperature sensor.
b. Output Device: DDC system analog output to modulating damper actuator(s).
c. Action: Modulate outdoor-, return-, and relief-air dampers to maintain air temperature set point of 55 deg F.

3. Unoccupied Time Schedule:

a. Input Device: DDC system time schedule.

b. Output Device: DDC system analog output to modulating damper actuator(s).
c. Action: Position outdoor- and relief-air dampers closed and return-air dampers open.

4. Display:

a. Mixed-air-temperature indication.
b. Mixed-air-temperature set point.
c. Mixed-air damper position.

D. Coordination of Air-Handling Unit Sequences: Ensure that preheat, mixed-air, heating-coil, and cooling-coil controls have common inputs and do not overlap in function.

E. Operator Station Display: Indicate the following on operator workstation display terminal:

1. DDC system graphic.
2. DDC system on-off indication.
3. DDC system occupied/unoccupied mode.
4. Outdoor-air-temperature indication.
5. Supply-fan on-off indication.
6. Supply-fan-discharge static-pressure indication.
7. Supply-fan-discharge static-pressure set point.
8. Supply-fan airflow rate.
9. Return-air static-pressure indication.
10. Return-air static-pressure set point.
11. Mixed-air-temperature indication.
12. Mixed-air-temperature set point.
13. Mixed-air damper position.
14. Relative humidity indication.
15. Relative humidity set point.
16. Relative humidity control-valve position.
17. Fan-discharge air-temperature indication.
18. Fan-discharge air-temperature set point.
19. Heating-coil air-temperature indication.
20. Heating-coil air-temperature set point.
21. Heating-coil pump operation indication.
22. Heating-coil control-valve position.
23. Cooling-coil air-temperature indication.
24. Cooling-coil air-temperature set point.
25. Cooling-coil control-valve position.
26. Room temperature indication.
27. Room temperature set point.

1.4 TERMINAL UNIT OPERATING SEQUENCE

A. Cabinet Unit Heater, Electric: Unit thermostat cycles fan and sequences stages of heating.

1.5 VENTILATION SEQUENCES

A. Exhaust Fan: Occupancy sensor and Interlock with light switch cycles fan. See Ventilation/Exhaust Fan schedule.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: More than 0.5 psig but not more than 2 psig.

C. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Delegated-Design Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. 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.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.2 PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.

7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches.

B. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig.
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.

C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers or equal: Subject to compliance with requirements:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

D. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers or equal: Subject to compliance with requirements:

a. BrassCraft Manufacturing Company; a Masco company.
b. Conbraco Industries, Inc.; Apollo Div.
c. Lyall, R. W. & Company, Inc.
d. McDonald, A. Y. Mfg. Co.
e. Perfection Corporation; a subsidiary of American Meter Company.

2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.

9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Bronze Plug Valves: MSS SP-78.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Lee Brass Company.
b. McDonald, A. Y. Mfg. Co.

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.

4. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Actaris.
b. American Meter Company.
c. Eclipse Combustion, Inc.
d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
e. Invensys.
f. Maxitrol Company.
g. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.

10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Canadian Meter Company Inc.
b. Eaton Corporation; Controls Div.
c. Harper Wyman Co.
d. Maxitrol Company.
e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

2.6 DIELECTRIC UNIONS

A. Dielectric Unions:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. Hart Industries International, Inc.
d. Jomar International Ltd.
e. Matco-Norca, Inc.
f. McDonald, A. Y. Mfg. Co.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.

2. Description:

a. Standard: ASSE 1079.
b. Pressure Rating: 125 psig minimum at 180 deg F.
c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.7 LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Steel Piping with Protective Coating:

1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
3. Replace pipe having damaged PE coating with new pipe.

C. Install fittings for changes in direction and branch connections.

3.2 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

Q. Connect branch piping from top or side of horizontal piping.

R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.

S. Do not use natural-gas piping as grounding electrode.

T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.3 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

3.4 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

3.5 HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.

2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

3.6 CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

A. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.8 FIELD QUALITY CONTROL

A. Test, inspect, and purge natural gas according to NFPA 54 and the International Fuel Gas Code and authorities having jurisdiction.

B. Natural-gas piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

A. Underground natural-gas piping shall be the following:
1. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

B. Aboveground natural-gas piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.10 INDOOR PIPING SCHEDULE

A. Aboveground, branch piping NPS 1 and smaller shall be the following:
   1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be the following:

   1. Steel pipe with malleable-iron fittings and threaded joints.
   2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.11 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

C. Valves in branch piping for single appliance shall be the following:

   1. One-piece, bronze ball valve with bronze trim.
   2. Two-piece, full-port, bronze ball valves with bronze trim.
   3. Bronze plug valve.

END OF SECTION 231123

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
4. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7. SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems".

1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations for selecting hangers and supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

a. Lighting fixtures.
b. Air outlets and inlets.
c. Speakers.
d. Sprinklers.
e. Access panels.
f. Perimeter moldings.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated. All exposed round duct shall be double wall with 1" insulation and perforated liner.

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

D. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.6 SEISMIC-RESTRAINT DEVICES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Cooper B-Line, Inc.; a division of Cooper Industries.
2. Ductmate Industries, Inc.
3. Hilti Corp.
4. Kinetics Noise Control.
5. Loos & Co.; Cableware Division.
6. Mason Industries.
7. TOLCO; a brand of NIBCO INC.
8. Unistrut Corporation; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an evaluation service member of the ICC Evaluation Service or an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.

10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an evaluation service member of the ICC Evaluation Service or an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Underground Ducts: Concrete-encased, Polyvinyl Chloride (PVC) seamless, extruded round duct. See Specification Section 233116.

C. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round: 12.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round: 6.

D. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round: 12.

2. Ducts Connected to Equipment Not Listed Above:
a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: A.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round: 12.

E. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg.
b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round: 12.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

3. Aluminum Ducts: Aluminum.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Manual volume dampers.
2. Control dampers.
3. Fire dampers.
4. Flange connectors.
5. Turning vanes.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

B. Related Requirements:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section "Digital, Addressable Fire-Alarm System" for duct-mounted fire and smoke detectors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control-damper installations.
d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

C. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Pottorff.
g. Ruskin Company.
h. Trox USA Inc.
i. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.

4. Frames:

    a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
    b. Mitered and welded corners.
    c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

    a. Molded synthetic.
    b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Air Balance Inc.; a division of Mestek, Inc.
    b. American Warming and Ventilating; a division of Mestek, Inc.
    c. McGill AirFlow LLC.
    d. Nailor Industries Inc.
    e. Pottorff.
    f. Ruskin Company.
    g. Trox USA Inc.
    h. Vent Products Company, Inc.

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:

    a. Multiple or single blade.
    b. Parallel- or opposed-blade design.
    c. Stiffen damper blades for stability.
    d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
    e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

6. Blade Axles: Nonferrous metal.
7. Bearings:

    a. Molded synthetic.

b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

C. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Aluminum pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Aluminum, die-cast core with dial and handle made of 3/32-inch- thick Aluminum , and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Lloyd Industries, Inc.
6. McGill AirFlow LLC.
7. Metal Form Manufacturing, Inc.
8. Nailor Industries Inc.
9. NCA Manufacturing, Inc.
10. Pottorff.
11. Ruskin Company.
12. Vent Products Company, Inc.
13. Young Regulator Company.

B. Frames:

1. Hat shaped.
2. 0.094-inch- thick, galvanized sheet steel.
3. Mitered and welded corners.

C. Blades: (Coastal Construction Dampers may be used if available)

1. Multiple blade with maximum blade width of 6 inches.
2. Parallel- and opposed-blade design.
3. Galvanized-steel.
4. 0.064 inch thick single skin.
5. Blade Edging: Closed-cell neoprene.

6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 FIRE DAMPERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff.
8. Prefco; Perfect Air Control, Inc.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.138 inch thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch-thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.6 FLANGE CONNECTORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Continuous and two sash locks.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd.
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

2.11 FLEXIBLE DUCTS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.

2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1. Minimum of “5”

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire dampers according to UL listing.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Downstream from control dampers, backdraft dampers, and equipment.

3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
4. At each change in direction and at maximum 50-foot spacing.
5. Upstream from turning vanes.
6. Upstream or downstream from duct silencers.
7. Control devices requiring inspection.
8. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.

J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

K. Install flexible connectors to connect ducts to equipment.

L. Connect diffusers to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

M. Connect flexible ducts to metal ducts with draw bands. Flexible duct to be a maximum 6 feet in length.

N. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Centrifugal roof ventilators.
2. Ceiling-mounted ventilators.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Florida product-specific NOA document for fan to meet wind loading per code.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Acme Engineering & Manufacturing Corporation.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Carnes Company.
4. Greenheck Fan Corporation.
5. Loren Cook Company.
6. PennBarry.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
1. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
2. Construction to meet and be certified under Miami-Dade missile impact certified.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
4. Backdraft Dampers: Parallel-blade dampers mounted in curb base.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches.
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.
5. Metal Liner: Galvanized steel.
6. Mounting Pedestal: Galvanized steel with removable access panel.

2.2 CEILING-MOUNTED VENTILATORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Breidert Air Products.
2. Carnes Company.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. PennBarry.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Isolation: Rubber-in-shear vibration isolators.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory

Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Secure roof-mounted fans to roof wind rated curbs with cadmium-plated hardware. See Division 07 Section "Roof Accessories" for installation of roof curbs. Hardware to meet Florida Wind Rated requirements.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.

4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round ceiling diffusers.
2. Square ceiling diffusers.
3. Fixed face registers and grilles.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Round Ceiling Diffuser:
1. Manufacturers or equal: Subject to compliance with requirements:

a. Anemostat Products; a Mestek company.
b. Carnes.
c. Hart & Cooley Inc.
d. METALAIRE, Inc.
e. Nailor Industries Inc.
f. Price Industries.
g. Titus.
h. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white.
5. Face Style: Three cone.
6. Mounting: Duct connection.
7. Pattern: Two-position horizontal.
8. Dampers: Combination damper and grid.

B. Square Ceiling Diffusers:
1. Manufacturers or equal: Subject to compliance with requirements,

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes.
d. Hart & Cooley Inc.
e. Krueger.
f. METALAIRE, Inc.
g. Nailor Industries Inc.
h. Price Industries.
i. Titus.
j. Tuttle & Bailey.

2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white.
5. Face Size: 24 by 24 inches or 12 by 12 inches.
6. Face Style: Three cone.
7. Mounting: T-bar.
8. Pattern: Fixed.
9. Dampers: Combination damper and grid.
10. Accessories:

a. Equalizing grid.

2.2 REGISTERS AND GRILLES

A. Adjustable Bar Register:
1. Manufacturers or equal: Subject to compliance with requirements,

a. A-J Manufacturing Co., Inc.
b. Anemostat Products; a Mestek company.
c. Carnes.
d. Dayus Register & Grille Inc.
e. Hart & Cooley Inc.
f. Krueger.
g. METALAIRE, Inc.
h. Nailor Industries Inc.
i. Price Industries.
j. Titus.
k. Tuttle & Bailey.

2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Vertical spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Horizontal spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.
8. Mounting: Countersunk screw.
9. Damper Type: Adjustable opposed blade.
10. Accessories:

    a. Rear-blade gang operator.

B. Fixed Face Grille:
1. Manufacturers or equal: Subject to compliance with requirements,

    a. A-J Manufacturing Co., Inc.
    b. Anemostat Products; a Mestek company.
    c. Carnes.
    d. Dayus Register & Grille Inc.
    e. Hart & Cooley Inc.
    f. Krueger.
    g. Nailor Industries Inc.
    h. Price Industries.
    i. Titus.
    j. Tuttle & Bailey.

2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch grid core.
5. Core Construction: Integral.
6. Frame: 1-1/4 inches wide.
7. Mounting: Countersunk screw or Lay in.

2.3 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or

other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 237413 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:

1. Direct-expansion cooling.
2. Gas furnace.
3. Economizer outdoor-, return-air damper and powered relief-air (see schedule) section.
4. Integral, space temperature controls.
5. Roof curbs.
6. BACNET interface for DDC
7. Low Ambient Cooling Operation

1.2 DEFINITIONS

A. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

B. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.

C. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

D. Supply-Air Fan: The fan providing supply-air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

E. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.3 PERFORMANCE REQUIREMENTS

A. Wind-Restraint Performance:
1. Building Classification Category: II.

2. Minimum 10 lb/sq. ft multiplied by the maximum area of the mechanical component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic Performance: RTUs shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1.4 ACTION SUBMITTALS

A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

B. Warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. ARI Compliance:

1. Comply with ARI 210/240 and ARI 340/360 for testing and rating energy efficiencies for RTUs.
2. Comply with ARI 270 for testing and rating sound performance for RTUs.

B. ASHRAE Compliance:

1. Comply with ASHRAE 15 for refrigerant system safety.
2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.

E. UL Compliance: Comply with UL 1995.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.
2. Warranty Period for Gas Furnace Heat Exchangers: Manufacturer's standard, but not less than 10 years from date of Substantial Completion.
3. Warranty Period for Solid-State Ignition Modules: Manufacturer's standard, but not less than three years from date of Substantial Completion.
4. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. AAON, Inc.
2. Carrier Corporation.
3. Lennox Industries Inc.
4. McQuay International.
5. Trane; American Standard Companies, Inc.
6. YORK International Corporation.

2.2 CASING

A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.

B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.

1. Exterior Casing Thickness: 0.0626 inch thick.

2. Coastal construction / ecoating finish painting.

C. Inner Casing Fabrication Requirements:

1. Inside Casing: Galvanized steel, 0.028 inch thick.

D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

1. Materials: ASTM C 1071, Type I.
2. Thickness: 1 inch.
3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
4. Liner Adhesive: Comply with ASTM C 916, Type I.

E. Condensate Drain Pans: Formed sections of galvanized-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.

1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
2. Drain Connections: Threaded nipple.
3. Pan-Top Surface Coating: Corrosion-resistant compound.

F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

A. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.

B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

C. Relief-Air Fan: Forward curved, shaft mounted on permanently lubricated motor.

D. Seismic Fabrication Requirements: Fabricate fan section, internal mounting frame and attachment to fans, fan housings, motors, casings, accessories, and other fan section components with reinforcement strong enough to withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" when fan-mounted frame and RTU-mounted frame are anchored to building structure.

E. Fan Motor: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.4 COILS

A. Supply-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
3. Coil Split: Interlaced. If more than one refrigerant circuit is used this would use Face Split instead.
4. Condensate Drain Pan: Galvanized steel with corrosion-resistant coating formed with pitch and drain connections complying with ASHRAE 62.1.

B. Outdoor-Air Refrigerant Coil:

1. Aluminum-plate fin and seamless copper tube in steel casing with equalizing-type vertical distributor.
2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.

2.5 REFRIGERANT CIRCUIT COMPONENTS

A. Number of Refrigerant Circuits: Two.

B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief.

C. Refrigeration Specialties:

1. Refrigerant: R-410A.
2. Expansion valve with replaceable thermostatic element.
3. Refrigerant filter/dryer.
4. Manual-reset high-pressure safety switch.
5. Automatic-reset low-pressure safety switch.
6. Minimum off-time relay.
7. Automatic-reset compressor motor thermal overload.
8. Brass service valves installed in compressor suction and liquid lines.

2.6 AIR FILTRATION

A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
1. Pleated: Minimum 90 percent arrestance, and MERV 7.

2.7 GAS FURNACE

A. Description: Factory assembled, piped, and wired; complying with ANSI Z21.47 and NFPA 54.

1. CSA Approval: Designed and certified by and bearing label of CSA.

B. Burners: Stainless steel.

1. Fuel: Natural gas.

2. Ignition: Electronically controlled electric spark or hot-surface igniter with flame sensor.

C. Heat-Exchanger and Drain Pan: Stainless steel.

D. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.

E. Safety Controls:

1. Gas Control Valve: Two stage.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 DAMPERS

A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.

B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.

1. Damper Motor: Modulating with adjustable minimum position.
2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.

2.9 ELECTRICAL POWER CONNECTION

A. Provide for single connection of power to unit with control-circuit transformer with built-in overcurrent protection.

2.10 CONTROLS – To be coordinated with Controls Rep and noted on the drawings.

A. DDC Controller:

1. Controller shall have volatile-memory backup.
2. Safety Control Operation:

a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
b. Fire Alarm Control Panel Interface: Provide control interface to coordinate with operating sequence described in Division 28 Section "Fire Detection and Alarm."

3. Scheduled Operation (to be coordinated with owner): Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.

4. Unoccupied Period:

    a. Heating Setback: 10 deg F .
    b. Cooling Setback: 10 deg F.
    c. Override Operation: Two hours.

5. Supply Fan Operation:

    a. Occupied Periods: Run fan continuously.
    b. Unoccupied Periods: Cycle fan to maintain setback temperature.

6. Refrigerant Circuit Operation:

    a. Occupied Periods: Cycle or stage compressors to match compressor output to cooling load to maintain room temperature. Cycle condenser fans to maintain maximum hot-gas pressure.
    b. Unoccupied Periods: Compressors cycle.
    c. Unit shall have low ambient cooling operation.

7. Gas Furnace Operation:

    a. Occupied Periods: Stage burner to maintain room temperature.
    b. Unoccupied Periods: Cycle burner to maintain setback temperature.

8. Economizer Outdoor-Air Damper Operation:

    a. Occupied Periods: Open to fixed minimum intake, and maximum 100 percent of the fan capacity to comply with ASHRAE Cycle II. Controller shall permit air-side economizer operation when outdoor air is less than 55 deg F. Use mixed-air temperature and select between outdoor-air and return-air enthalpy to adjust mixing dampers. During economizer cycle operation, lock out cooling.
    b. Unoccupied Periods: Close outdoor-air damper and open return-air damper.

B. Interface Requirements for HVAC Instrumentation and Control System:
    1. Provide BACnet compatible interface for central HVAC control workstation for the following:

        a. Adjusting set points.
        b. Monitoring supply fan start, stop, and operation.
        c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.
        d. Monitoring occupied and unoccupied operations.

2.11 ACCESSORIES

A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.

B. Hail guards of galvanized steel, painted to match casing.

C. Provide factory install smoke detectors in the supply and return air stream.

2.12 ROOF CURBS

A. Roof curbs with vibration isolators and wind or seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.

1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.

a. Materials: ASTM C 1071, Type I or II.
b. Thickness: 2 inches.

2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.

a. Liner Adhesive: Comply with ASTM C 916, Type I.
b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
d. Liner Adhesive: Comply with ASTM C 916, Type I.

C. Curb Height: 14 inches.

D. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for wind-load requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts". Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

B. Install wind and seismic restraints according to manufacturer's written instructions.

C. Coordinate piping and duct installations and specialty arrangements with schematics on Drawings and with requirements specified in piping and duct systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

D. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

E. Install piping adjacent to RTUs to allow service and maintenance.

1. Gas Piping: Comply with applicable requirements in Division 23 Section "Facility Natural-Gas Piping." Connect gas piping to burner, full size of gas train inlet, and connect with union and shutoff valve with sufficient clearance for burner removal and service.

F. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:

1. Install ducts to termination at top of roof curb.
2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
3. Connect supply ducts to RTUs with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
4. Install return-air duct continuously through roof structure.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.

C. Tests and Inspections:

1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace malfunctioning units and retest as specified above.

3.3 CLEANING AND ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.

B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

END OF SECTION 237413

SECTION 237433 - DEDICATED OUTDOOR-AIR UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes factory-packaged units capable of supplying up to 100 percent outdoor air and providing cooling and heating.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof-curb mounting details, drawn to scale, and coordinated with each other, using input from installers of the items involved:

B. Seismic Qualification Certificates: For dedicated outdoor-air units, accessories, and components, from manufacturer.

C. Startup service reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Compressors: Five years from date of Substantial Completion.
2. Warranty Period for Heat Exchangers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. AAON.
2. Addison.
3. Carrier Corp.
4. Desert Aire.
5. Engineered Air.
6. Munters Corporation, Dehumidification Division; Des Champs Products.
7. Trane

B. General Fabrication Requirements: Comply with requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment," and Section 7 - "Construction and System Start-up."

C. Seismic Performance: Units shall withstand the effects of earthquake motions determined according to ASCE/SEI 7

D. Wind-Restraint Performance:
1. Building Classification Category: II.
2. Minimum 10 lb/sq. ft multiplied by the maximum area of unit projected on a vertical plane that is normal to the wind direction and 45 degrees either side of normal.

E. Cabinet Thermal Performance:

1. Maximum Overall U-Value: Comply with requirements in ASHRAE/IESNA 90.1.
2. Maximum Overall U-Value: 0.10 Btu/h x sq. ft. x deg F.
3. Include effects of metal-to-metal contact and thermal bridges in the calculations.

F. Cabinet Surface Condensation:

1. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.
2. Portions of cabinet located downstream from the cooling coil shall have a thermal break at each thermal bridge between the exterior and interior casing to prevent condensation from occurring on the interior and exterior surfaces. The thermal break shall not compromise the structural integrity of the cabinet.

G. Maximum Cabinet Leakage: 0.5 percent of the total supply-air flow at a pressure rating equal to the fan shut-off pressure.

H. Cabinet Deflection Performance:

1. Walls and roof deflection shall be within 1/240 of the span at the design working pressure equal to the fan shut-off pressure. Deflection limits shall be measured at any point on the surface.

2. Floor deflections shall be within 1/240 of the span considering the worst-case condition caused by the following:
   a. Internal components.
   b. Design working pressure defined for the walls and roof.

I. 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.

2.2 CABINET

A. Construction: Double wall.

B. Exterior Casing Material: Galvanized steel with paint finish.

C. Interior Casing Material: Galvanized steel(Coastal finish meeting ASTM salt-spray testing standard).

D. Lifting and Handling Provisions: Factory-installed shipping skids and lifting lugs.

E. Base Rails: Galvanized-steel rails for mounting on roof curb or pad as indicated.

F. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.

1. Service Doors: Hinged access doors with gaskets. Material and construction of doors shall match material and construction of cabinet in which doors are installed.

G. Roof: Standing seam or membrane; sloped to drain water.

H. Floor: Reinforced, metal surface; reinforced to limit deflection when walked on by service personnel. Insulation shall be below metal walking surface.

I. Cabinet Insulation:

1. Type: Fibrous-glass duct lining complying with ASTM C 1071, Type II or flexible elastomeric insulation complying with ASTM C 534, Type II, sheet materials.
2. Thickness: 2 inches.
3. Insulation Adhesive: Comply with ASTM C 916, Type I.
4. Mechanical Fasteners: Suitable for adhesive, mechanical, or welding attachment to casing without damaging liner and without causing air leakage when applied as recommended by manufacturer.

J. Condensate Drain Pans:

1. Shape: Rectangular, with 2 percent slope in at least two planes to direct water toward drain connection.
2. Size: Large enough to collect condensate from cooling coils including coil piping connections, coil headers, and return bends.

a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
b. Depth: A minimum of 2 inches deep.

3. Configuration: Single wall.
4. Material: Galvanized-steel sheet with asphaltic waterproofing compound coating on pan top surface.
5. Drain Connection:

a. Located on one end of pan, at lowest point of pan.
b. Terminated with threaded nipple.
c. Minimum Connection Size: NPS 1.

6. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.

K. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1 for resistance to mold and erosion.

L. Roof Curb: Full-perimeter curb of sheet metal, minimum 16 inches high, with wood nailer, neoprene sealing strip, and welded Z-bar flashing.

1. Comply with requirements in "The NRCA Roofing Manual."

2.3 SUPPLY FAN

A. Forward-Curved Fan Type: Centrifugal; statically and dynamically balanced.

1. Fan Wheel Material: Galvanized steel, mounted on solid-steel shaft.
2. Bearings: Self-aligning, permanently lubricated ball bearings.

B. Service Factor for Belt Drive Applications: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly with minimum 1.5 service factor.

C. Motors:

1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Enclosure: Open dripproof.
3. Enclosure Materials: Rolled steel.
4. Efficiency: Premium efficient.

D. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with spring isolators.

2.4 EXHAUST FANS

A. Exhaust dampers shall be sized for 100% relief.

B. Fans and motors shall be dynamically balanced.

C. Motors shall be premium efficiency ODP with ball bearings rated for 200,000 hours service with external lubrication points.

D. Access to exhaust fans shall be through double wall, hinged access doors with quarter turn lockable handles.

E. Unit shall include belt driven, unhoused, backward curved, plenum exhaust fans.

2.5 COOLING COILS

A. Capacity Ratings: Comply with ASHRAE 33 and ARI 410 and coil bearing the ARI label.

B. Coil Casing Material: Manufacturer's standard material.

C. Tube Material: Copper.

D. Tube Header Material: Manufacturer's standard material.

E. Fin Material: Aluminum.

F. Fin and Tube Joints: Mechanical bond.

G. Leak Test: Coils shall be leak tested with air underwater.

H. Refrigerant Coil Capacity Reduction: Circuit coils for interleaved control.

I. Refrigerant Coil Suction and Distributor Header Materials: Seamless copper tube with brazed joints.

J. Coating: Phenolic epoxy corrosion-protection coating after assembly.

2.6 REFRIGERATION SYSTEM

A. Comply with requirements in ASHRAE 15, "Safety Standard for Refrigeration Systems."

B. Refrigerant Charge: Factory charged with refrigerant and filled with oil.

C. Compressors: Scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater.

D. Refrigerant: R-410A.

1. Classified as Safety Group A1 according to ASHRAE 34.
2. Provide unit with operating charge of refrigerant.

E. Refrigeration System Specialties:

1. Expansion valve with replaceable thermostatic element.
2. Refrigerant dryer.
3. High-pressure switch.
4. Low-pressure switch.

5. Thermostat for coil freeze-up protection during low ambient temperature operation or loss of air.
6. Brass service valves installed in discharge and liquid lines.

F. Capacity Control:

1. Hot-gas bypass refrigerant control for capacity control with continuous dehumidification on a single compressor.
2. Patented, Rawal APR control with zero to 100 percent modulating capacity control using hot-gas bypass. Evaporator coil shall be continuously active for dehumidification.
3. Single compressor with evaporator and condenser coil within the refrigerant section to provide initial pre-cooling and to reheat for humidity control.

G. Refrigerant condenser coils:

1. Capacity Ratings: Complying with ASHRAE 33 and ARI 410 and coil bearing the ARI label.
2. Tube Material: Copper.
3. Fin Material: Aluminum.
4. Fin and Tube Joint: Mechanical bond.
5. Leak Test: Coils shall be leak tested with air underwater.
6. Coating: Phenolic epoxy corrosion-protection coating after assembly.

H. Condenser Fan Assembly:

1. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades.
2. Fan Motors:

   a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
   b. Motor Enclosure: Totally enclosed non-ventilating (TENV) or totally enclosed air over (TEAO) enclosure.
   c. Enclosure Materials: Rolled steel.
   d. Motor Bearings: Permanently lubricated bearings.
   e. Built-in overcurrent and thermal-overload protection.
   f. Efficiency: Premium efficient.

3. Fan Safety Guards: Steel with corrosion-resistant coating.

I. Safety Controls:

1. Compressor motor and condenser coil fan motor low ambient lockout.
2. Overcurrent protection for compressor motor.

2.7 INDIRECT-FIRED GAS FURNACE HEATING

A. Furnace Assembly:

1. Factory assembled, piped, and wired.

2. Comply with requirements in NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."
3. AGA Approval: Designed and certified by and bearing label of AGA.

B. Burners:

1. Heat-Exchanger Material: Aluminized steel with stainless-steel inserts with a minimum thermal efficiency of 80 percent.
2. Fuel: Natural gas.
3. Ignition: Electronically controlled electric spark with flame sensor.

C. Heat-Exchanger Drain Pan Material: Stainless steel.

D. Venting: Power vent with integral, motorized centrifugal fan interlocked with gas valve.

E. Safety Controls:

1. Gas Control Valve: Electronic modulating.
2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

2.8 OUTDOOR-AIR INTAKE HOOD

A. Type: Manufacturer's standard hood or louver.

B. Materials: Match cabinet.

C. Bird Screen: Comply with requirements in ASHRAE 62.1.

D. Configuration: Designed to inhibit wind-driven rain and snow from entering unit.

2.9 OUTDOOR-AIR / ECONOMIZER

A. Unit shall include 0-100% economizer consisting of a motor operated outside air damper and return air damper assembly constructed of extruded aluminum, hollow core, airfoil blades with rubber edge seals and aluminum end seals. Damper blades shall be gear driven and designed to have no more than 15 cfm of leakage per sq. ft. of damper area when subjected to 2 inches w.g. air pressure differential across the damper. Damper assembly shall be controlled by spring return actuator. Unit shall include outside air opening bird screen, outside air hood, and barometric relief dampers.

2.10 Energy Recovery

A. Unit shall contain a factory mounted and tested energy recovery wheel. The energy recovery wheel shall be mounted in a rigid frame containing the wheel drive motor, drive belt, wheel seals and bearings. Frame shall slide out for service and removal from the cabinet.

B. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt.

C. Wheel shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix.

D. Wheel shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks.

E. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

F. The energy recovery cassette shall be an Underwriters Laboratories Recognized Component for electrical and fire safety. The wheel drive motor shall be an Underwriters Laboratory Recognized Component and shall be mounted in the cassette frame and supplied with a service connector or junction box. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Energy Recovery Ventilation Equipment. Cassettes shall be listed in the AHRI Certified Products.

G. Energy recovery wheel cassette shall carry a 5 year non-prorated warranty, from the date of original equipment shipment from the factory. The first 12 months from the date of equipment startup, or 18 months from the date of original equipment shipment from the factory, whichever is less, shall be covered under the standard parts warranty. The 5 year warranty applies to all parts and components of the cassette, with the exception of the motor, which shall carry an 18 month warranty. Warranty shall cover material and workmanship that prove defective, within the specified warranty period, provided written instructions for Installation, Operation, and Maintenance have been followed. Warranty excludes parts associated with routine maintenance, such as belts.

H. Unit shall include 4 inch thick, pleated panel outside air filters with an ASHRAE efficiency of 30% and MERV rating of 8, upstream of the wheels.

I. Hinged service access doors shall allow access to the wheel.

Total energy recovery wheels shall be coated with silica gel desiccant permanently bonded by a process without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity

2.10 FILTERS

A. Disposable Panel Filters:

1. Comply with NFPA 90A.
2. Factory-fabricated, viscous-coated, flat-panel type.
3. Thickness: 1 inch.
4. Minimum Merv: 8, according to ASHRAE 52.2.
5. Media: Interlaced glass fibers sprayed with nonflammable adhesive.

B. Mounting Frames:

1. Panel filters arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or from access plenum.
2. Extended surface filters arranged for flat orientation, removable from access plenum.
3. Galvanized or stainless steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.

2.11 ELECTRICAL POWER CONNECTIONS

A. General Electrical Power Connection Requirements: Factory-installed and -wired switches, motor controllers, transformers, and other necessary electrical devices shall provide a single-point field power connection to unit.

B. Enclosure: NEMA 250, Type 3R, mounted in unit with hinged access door in unit cabinet having a lock and key or padlock and key,

C. Wiring: Numbered and color-coded to match wiring diagram.

D. Wiring Location: Install factory wiring outside an enclosure in a raceway.

E. Power Interface: Field power interface shall be to wire lugs.

F. Factory Wiring: Branch power circuit to each motor and to controls with one of the following disconnecting means:

1. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
2. NEMA KS 1, heavy-duty, nonfusible switch.
3. UL 489, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

G. Factory-Mounted, Overcurrent-Protection Service: For each motor.

H. Transformer: Factory mounted with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.

I. Controls: Factory wire unit-mounted controls where indicated.

J. Receptacle: Factory wire unit-mounted, ground fault interrupt (GFI) duplex receptacle.

K. Control Relays: Auxiliary and adjustable time-delay relays.

2.12 CONTROLS

A. Control equipment and sequence of operation are specified in Division 23 Section "Instrumentation and Control for HVAC."

B. Control Wiring: Factory wire connection for controls' power supply.

C. Control Devices: Sensors, transmitters, relays, switches, detectors, operators, actuators, and valves shall be manufacturer's standard items to accomplish indicated control functions.

D. Unit-Mounted Status Panel:

1. Cooling/Off/Heating Controls: Control operational mode.
2. Damper Position: Indicate position of outdoor-air dampers in terms of percentage of outdoor air.
3. Status Lights:

    a. Filter dirty.
    b. Fan operating.
    c. Cooling operating.
    d. Heating operating.
    e. Smoke alarm.
    f. General alarm.

4. Digital Numeric Display:

    a. Outdoor airflow.
    b. Supply airflow.
    c. Outdoor dry-bulb temperature.
    d. Outdoor dew point temperature.
    e. Space temperature.
    f. Supply temperature.
    g. Space relative humidity.

E. Control Dampers:

1. Damper Location: Factory installed inside unit for ease of blade axle and bushing service. Arrange dampers located in a mixing box to achieve convergent airflow to minimize stratification.
2. Damper Leakage: Comply with requirements in AMCA 500-D. Leakage shall not exceed 6.5 cfm per sq. ft. at a static-pressure differential of 4.0 inches water column when a torque of 5 inch pounds per sq. ft. is applied to the damper jackshaft.
3. Damper Rating: Rated for close-off pressure equal to the fan shutoff pressure.
4. Damper Label: Bear the AMCA seal for both air leakage and performance.
5. Blade Configuration: Unless otherwise indicated, use parallel blade configuration for two-position control and equipment isolation service and use modulating control when mixing two airstreams. For other applications, use an opposed-blade configuration.
6. Damper Frame Material: galvanized steel.
7. Blade Type: Single-thickness metal reinforced with multiple V-grooves or hollow-shaped airfoil.

8. Blade Material: galvanized steel.
9. Maximum Blade Width: 6 inches.
10. Maximum Blade Length: 48 inches.
11. Blade Seals: Replaceable, continuous perimeter vinyl seals and jambs with stainless-steel compression-type seals.
12. Bearings: Thrust bearings for vertical blade axles.
13. Airflow Measurement:

    a. Monitoring System: Complete and functioning system of airflow monitoring as an integral part of the damper assembly where indicated.
    b. Remote Monitoring Signal: 0-10 volt or 4-20 mA scaled signal.
    c. Accuracy of flow measurement: Within 5 percent of the actual flow rate between the range of the scheduled minimum and maximum airflow. For units with a large range between minimum and maximum airflow, configure the damper sections and flow measurement assembly as necessary to comply with accuracy.
    d. Straightening Device: Integral to the flow measurement assembly if required to achieve the specified accuracy as installed.
    e. Flow measuring device: Suitable for operation in untreated and unfiltered outdoor air. If necessary, include temperature and altitude compensation and correction to maintain the accuracy.

F. Damper Operators:

1. Factory-installed electric operator for each damper assembly with one operator for each damper assembly mounted to the damper frame.
2. Operator capable of shutoff against fan pressure and able to operate the damper with sufficient reserve power to achieve smooth modulating action and proper speed of response at the velocity and pressure conditions to which the damper is subjected.
3. Maximum Operating Time: Open or close damper 90 degrees in 60 seconds.
4. Adjustable Stops: For both maximum and minimum positions.
5. Position Indicator and Graduated Scale: Factory installed on each actuator with words "OPEN" and "CLOSED," or similar identification, at travel limits.
6. Spring-return operator to fail-safe; either closed or open as required by application.
7. Operator Type: Direct coupled, designed for minimum 60,000 full-stroke cycles at rated torque.
8. Position feedback Signal: For remote monitoring of damper position.
9. Coupling: V-bolt and V-shaped, toothed cradle.
10. Circuitry: Electronic overload or digital rotation-sensing circuitry.

G. Refrigeration System Controls:

1. Unit-mounted enthalpy controller shall lock out refrigerant system when outdoor-air enthalpy is less than 28 Btu/lb of dry air or outdoor-air temperature is less than 60 deg F.
2. Outdoor-air sensor de-energizes dehumidifier operation when outdoor-air temperature is less than 60 deg F.
3. Relative-humidity sensor energizes dehumidifier operation when relative humidity is more than 50 percent.

H. Furnace Controls:

1. Factory-mounted sensor in supply outlet with sensor adjustment located in control panel to modulate gas furnace burner to maintain space temperature.
2. Wall-mounted, space-temperature sensor with temperature adjustment to modulate gas furnace burner to maintain space temperature.
3. Remote Setback: Adjustable room thermostat selected by timer, set at 50 deg F; cycles supply fan and gas furnace burner to maintain space temperature.
4. Electromechanical or Electronic Burner Control: 20 to 100 percent modulation of the firing rate; 10 to 100 percent with dual-furnace units.

I. Integral Smoke Alarm: Smoke detector installed in supply and return air.

J. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display unit status and alarms.

1. Hardwired Points:

a. Monitoring: On-off status, common trouble alarm.
b. Control: On-off operation, space temperature set-point adjustment supply temperature set-point adjustment, and space humidity set-point adjustment.

2. ASHRAE 135 (BACnet) communication interface with the BAS shall enable the BAS operator to remotely control and monitor the unit from an operator workstation. Control features and monitoring points displayed locally at unit control panel shall be available through the BAS.

2.13 ACCESSORIES

A. Duplex Receptacle: Factory mounted in unit supply-fan section, with 20 amp 120 V GFI duplex receptacle and weatherproof cover.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's rigging and installation instructions for unloading units and moving to final locations.

B. Curb Support: Install roof curb on roof structure according to "The NRCA Roofing Manual."

1. Install and secure units on curbs and coordinate roof penetrations and flashing with roof construction.
2. Coordinate size, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."
3. Coordinate size, location, and installation of unit manufacturer's roof curbs and equipment supports with roof Installer.

C. Restrained Curb Support: Install restrained vibration isolation roof-curb rails on roof structure according to "The NRCA Roofing Manual."

1. Restrained isolation roof-curb rails are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
2. Install and secure units on curbs and coordinate roof penetrations and flashing with roof construction.
3. Install flexible duct connectors. Comply with requirements in Division 23 Section "Air Duct Accessories" for flexible duct connectors.
4. Install vibration isolation and seismic-control devices. Comply with requirements in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation and seismic-control devices.
5. Coordinate size, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."
6. Coordinate size, location, and installation of unit manufacturer's roof curbs and equipment supports with roof Installer.

D. Install wall- and duct-mounted sensors furnished by manufacturer for field installation. Install control wiring and make final connections to control devices and unit control panel.

E. Comply with requirements for gas-fired furnace installation in NFPA 54, "National Fuel Gas Code."

F. Install separate devices furnished by manufacturer and not factory installed.

G. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

H. Install drain pipes from unit drain pans to roof drain.

1. Drain Piping: Drawn-temper copper water tubing complying with ASTM B 88, Type L, with soldered joints.

2. Pipe Size: Same size as condensate drain pan connection.

3.2 CONNECTIONS

A. Where installing piping adjacent to units, allow space for service and maintenance.

B. Gas Piping Connections:

1. Comply with requirements in Division 23 Section "Facility Natural-Gas Piping."
2. Connect gas piping to furnace, full size of gas train inlet, and connect with union, pressure regulator, and shutoff valve with sufficient clearance for burner removal and service.
3. Install AGA-approved flexible connectors.

C. Duct Connections:

1. Comply with requirements in Division 23 Section "Metal Ducts."

2. Drawings indicate the general arrangement of ducts.
3. Connect ducts to units with flexible duct connectors. Comply with requirements for flexible duct connectors in Division 23 Section "Air Duct Accessories."

D. Electrical Connections: Comply with requirements for power wiring, switches, and motor controls in Division 26 Sections.

1. Install electrical devices furnished by unit manufacturer but not factory mounted.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Inspect units for visible damage to furnace combustion chamber.
3. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

    a. Measure gas pressure at manifold.
    b. Measure combustion-air temperature at inlet to combustion chamber.
    c. Measure flue-gas temperature at furnace discharge.
    d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

4. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
5. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:

    a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
    b. Cooling coil entering-air, dry- and wet-bulb temperatures.
    c. Condenser coil entering-air dry-bulb temperature.
    d. Condenser coil leaving-air dry-bulb temperature.

6. Simulate maximum cooling demand and inspect the following:

    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short-circuiting of air through outside coil or from outside coil to outdoor-air intake.

7. Inspect casing insulation for integrity, moisture content, and adhesion.
8. Verify that clearances have been provided for servicing.
9. Verify that controls are connected and operable.
10. Verify that filters are installed.
11. Clean coils and inspect for construction debris.
12. Clean furnace flue and inspect for construction debris.
13. Inspect operation of power vents.
14. Purge gas line.
15. Inspect and adjust vibration isolators and seismic restraints.

16. Verify bearing lubrication.
17. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
18. Adjust fan belts to proper alignment and tension.
19. Start unit.
20. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
21. Operate unit for run-in period.
22. Calibrate controls.
23. Adjust and inspect high-temperature limits.
24. Inspect outdoor-air dampers for proper stroke.
25. Verify operational sequence of controls.
26. Measure and record the following airflows. Plot fan volumes on fan curve.

    a. Supply-air volume.
    b. Return-air flow.
    c. Outdoor-air flow.

B. After startup, change filters, verify bearing lubrication, and adjust belt tension.

C. Remove and replace components that do not properly operate and repeat startup procedures as specified above.

D. Prepare written report of the results of startup services.

3.4 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 237433

SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: One year from date of Substantial Completion.
c. For Labor: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:
1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
2. LG Electronics.
3. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
4. SANYO North America Corporation; SANYO Fisher Company.
5. Trane; a business of American Standard companies.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
3. Fan: Direct drive, centrifugal.
4. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Enclosure Type: Totally enclosed, fan cooled.
d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
f. Mount unit-mounted disconnect switches on exterior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
b. Single-wall, galvanized-steel sheet.
c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

7. Air Filtration Section:

a. General Requirements for Air Filtration Section:

1) Comply with NFPA 90A.
2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
3) Filter-Holding Frames: Filters shall be removable from one side or lifted out from access plenum.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
c. Refrigerant Charge: R-410A.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 45 deg F .
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

B. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Install seismic restraints.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

SECTION 238239 - UNIT HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Equipment schedules to include rated capacities, furnished specialties, and accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 WALL AND CEILING HEATERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Berko Electric Heating; a division of Marley Engineered Products.
2. Chromalox, Inc.; a division of Emerson Electric Company.
3. Markel Products; a division of TPI Corporation.
4. Marley Electric Heating; a division of Marley Engineered Products.
5. QMark Electric Heating; a division of Marley Engineered Products.
6. Trane.

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:

1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.

F. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

G. Controls: Unit-mounted thermostat.

H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install unit heaters to comply with NFPA 90A.

B. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

C. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of unit heater.

D. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

E. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

F. Install piping adjacent to machine to allow service and maintenance.

G. Connect piping to cabinet unit heater's factory, hot-water piping package. Install the piping package if shipped loose.

H. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."

I. Comply with safety requirements in UL 1995.

J. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

K. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238239

SECTION 26 05 00 – ELECTRICAL SYSTEMS COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The purpose of this section is to specify Division 26 responsibilities in the commissioning process which are being directed by the CA. Other electrical systems testing is required under the direction of the General Contractor.

B. The list of commissioned equipment and systems is found in Section 019113, 1.7.

C. Commissioning requires the participation of Division 26 to ensure that all systems are operating in a manner consistent with the Contract Documents. The general commissioning requirements and coordination are detailed in Section 019113. Division 26 shall be familiar with all parts of Division 01 and the *Commissioning Plan* issued by the CA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.

1.2 RESPONSIBILITIES

A. Electrical Contractors. The commissioning responsibilities applicable to the electrical contractor are as follows *(all references apply to commissioned equipment only)*:

Construction and Acceptance Phases

1. Include the cost of commissioning in the contract price (do NOT include the cost of the Commissioning Authority as they are under contract to the Owner).
2. In each purchase order or subcontract written, include requirements for submittal data, O&M data and training.
3. Attend a pre-commissioning meeting and other meetings necessary to facilitate the Cx process. Meetings regarding the Commissioning Process that may be required throughout the construction period will be scheduled as agenda items at the General Contractor's regularly scheduled construction coordination meetings. An exception to this policy would be extraordinary meetings which are deemed necessary by the CA and the General Contractor with necessary parties attending in order to resolve outstanding deficiencies toward the end of the construction period.
4. Contractors shall provide normal cut sheets and shop drawing submittals to the CA of commissioned equipment in print and digital PDF format..
5. Provide additional requested documentation, prior to normal O&M manual submittals, to the CA for development of start-up and functional testing procedures.
    a. Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting and maintenance procedures, full details of any owner-contracted tests, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.

   b. The Commissioning Agent may request further documentation necessary for the commissioning process.
   c. This data request may be made prior to normal submittals.
6. Provide a copy of the O&M manuals submittals of commissioned equipment, through normal channels, to the CA for use in developing checklists and tests. O&M manuals shall be provided in print and digital PDF format.
7. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Provide assistance to the CA in preparation of the specific functional performance test procedures specified in the *Commissioning Plan – Construction Phase*. Subs shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
9. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the prefunctional checklists from the CA. Submit manufacturer's detailed start-up procedures and the full start-up plan and procedures and other requested equipment documentation to CA for review.
10. Assist the CA in completion of the prefunctional checklists, in particular execute the electrical-related start-up and check-out portions of the prefunctional checklists for all commissioned equipment.
11. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CA.
12. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
13. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
14. Perform functional performance testing under the direction of the CA for specified equipment in the *Commissioning Plan* and 019113. Assist the CA in interpreting the monitoring data, as necessary.
15. Correct deficiencies (differences between specified and observed performance) as interpreted by the CA, PM and A/E and retest the equipment.
16. Prepare O&M manuals according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
17. During construction, maintain as-built red-line drawings for all drawings and final CAD as-builts for contractor-generated coordination drawings. Update after completion of commissioning (excluding deferred testing). Prepare red-line as-built drawings for all drawings and final as-builts for contractor-generated coordination drawings.
18. Provide training of the Owner's operating staff using expert qualified personnel, as specified.
19. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.

Warranty Period

1. Execute seasonal or deferred functional performance testing, witnessed by the CA, according to the specifications.

2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

B. Electrical Designer/Engineer

1. Refer to Section 019113 for the responsibilities of the Electrical Designer/Engineer.

1.3 RELATED WORK

A. Refer to Section 019113, Part 1.4 for a listing of all sections where commissioning requirements are found.

B. Refer to Section 019113 Part 1.7 for systems to be commissioned and section 019113 Part 1.6 and the *Commissioning Plan* for functional testing requirements.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Division 26 shall provide all test equipment necessary to fulfill the testing requirements of this Division.

B. Refer to Section 019113 Part 2.1 for additional Division 26 requirements.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Division 26 shall provide submittal documentation relative to commissioning to the CA as requested by the CA. Refer to Section 019113 Part 3.3 for additional Division 26 requirements.

3.2 STARTUP

A. The electrical contractors shall follow the start-up and initial checkout procedures listed in the Responsibilities list in this section and in 019113 Part 3.4. Division 26 has start-up responsibility and is required to complete systems and sub-systems so they are fully functional, meeting the design objectives of the Contract Documents. The commissioning procedures and functional testing do not relieve or lessen this responsibility or shift that responsibility partially to the commissioning agent or Owner.

B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems, or sub-systems at the discretion of the CA and PM. Beginning system testing before full completion, does not relieve the Contractor from fully completing the system, including all prefunctional checklists as soon as possible.

3.3 FUNCTIONAL PERFORMANCE TESTS

A. Refer to Section 019113 Part 1.7 for a list of systems to be commissioned and to Part 3.6 for a description of the process and to the *Commissioning Plan* for specific details on the required functional performance tests.

3.4 TESTING DOCUMENTATION, NON-CONFORMANCE AND APPROVALS

A. Refer to Section 019113 Part 3.4 for specific details on non-conformance issues relating to prefunctional checklists and tests.

B. Refer to Section 019113 Part 3.7 for issues relating to functional performance tests.

3.5 OPERATIONS AND MAINTENANCE (O&M) MANUALS

A. Division 26 shall compile and prepare documentation for all equipment and systems covered in Division 26 and deliver to the General Contractor for inclusion in the O&M manuals, according to O&M Documentation requirements elsewhere in these specifications.

B. The CA shall receive a copy of the final compiled O&M manuals for review.

3.6. TRAINING OF OWNER PERSONNEL

A. The CM shall coordinate with the Owner for desired training sequencing and scheduling and shall provide the approved schedule of training to the Owner and CA for review and approval. The Mechanical Contractor, Controls Contractor, Electrical Contractor, and Equipment Suppliers shall complete all training activities and documentation as directed by the CM, the approved schedule, and the specific equipment specification sections.

END OF SECTION 26 05 00

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire rated 600 V or less.
2. Metal-clad cable, Type MC, rated 600 V or less.
3. Fire-alarm wire and cable.
4. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable

C. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers or equal: Subject to compliance with requirements:

1. Alpha Wire; brand of Belden, Inc.
2. Belden Inc.
3. Encore Wire Corporation.
4. Okonite Company (The).
5. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:
1. Type THHN and Type THWN-2: Comply with UL 83.
2. : Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers or equal: Subject to compliance with requirements:

1. Okonite Company (The).
2. Service Wire Co.
3. Southwire Company, LLC.
4. WESCO.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

F. Ground Conductor: Insulated.

G. Conductor Insulation:

1. Type TFN/THHN/THWN-2: Comply with UL 83.
2. Type XHHW-2: Comply with UL 44.

H. Armor: Steel, interlocked.

I. Jacket: PVC applied over armor.

2.3 FIRE-ALARM WIRE AND CABLE

A. Manufacturers or equal: Subject to compliance with requirements:

1. Allied Wire & Cable Inc.
2. CommScope, Inc.
3. Genesis Cable Products; Honeywell International, Inc.
4. PYROTENAX; brand of nVent Electrical plc.
5. Superior Essex Inc.; subsidiary of LS Corp.
6. West Penn Wire; brand of Belden, Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers or equal: Subject to compliance with requirements:

1. 3M Electrical Products.
2. ABB, Electrification Business.
3. Hubbell Utility Solutions; Hubbell Incorporated.
4. ILSCO.
5. Ideal Industries, Inc.
6. NSi Industries LLC.
7. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.

C. Jacketed Cable Connectors: For steel jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with long barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper, Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway Metal-clad cable, Type MC.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

A. Comply with NFPA 72.

B. Wiring Method: Install wiring in metal pathway.

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.

    a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.

3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is not permitted.
4. Signaling Line Circuits: Power-limited fire-alarm cables may be installed in the same cable or pathway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

F. Wiring to Remote Alarm Transmitting Device: 1 inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un spliced conductors].

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.

D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.6 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Grounding (earthing) electrodes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product indicated.

B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control" Article, including the following:

1. Test wells.
2. Rod electrodes.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. ERICO; brand of nVent Electrical plc.
   b. Harger Lightning & Grounding; business of Harger, Inc.

2. Referenced Standards: Complying with one or more of the following:

   a. Soft or Annealed Copper Wire: ASTM B3
   b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
   c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
   d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/ B787M.

2.2 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. Performance Criteria:

1. Regulatory Requirements:

   a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

   a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
   b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

   c.

C. UL KDER and KDSH - Hex-Fitting-Type Pipe and Rod Grounding and Bonding Clamp:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. ABB, Electrification Business.
   b. Cooper B-line; brand of Eaton, Electrical Sector.
   c. Crouse-Hinds; brand of Eaton, Electrical Sector.
   d. ERICO; brand of nVent Electrical plc.
   e. ILSCO.
   f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
   g. Panduit Corp.

2. General Characteristics:

   a. Two pieces with zinc-plated bolts.

b. Clamp Material: Die-cast zinc alloy.
c. Listed for outdoor use.

D. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Cooper B-line; brand of Eaton, Electrical Sector.
c. Crouse-Hinds; brand of Eaton, Electrical Sector.
d. ERICO; brand of nVent Electrical plc.
e. Harger Lightning & Grounding; business of Harger, Inc.
f. ILSCO.
g. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
h. Panduit Corp.

2. General Characteristics:

a. Clamp Material: Aluminum.
b. Listed for outdoor use.

DI. UL KDER and KDSH - Strap-Type Pipe and Rod Grounding and Bonding Clamp:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
d. Panduit Corp.

DII. UL KDER - Beam Grounding and Bonding Clamp:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Panduit Corp.
d. Penn-Union Corp.; subsidiary of Nesco, Inc.

2. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

DIII. UL KDER - Exothermically Welded Connection:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.

b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
d. Crouse-Hinds; brand of Eaton, Electrical Sector.
e. ERICO; brand of nVent Electrical plc.
f. Harger Lightning & Grounding; business of Harger, Inc.

2. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Bonding Bushing

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. General Characteristics: Threaded bushing with insulated throat.

D. UL KDER - Grounding Bushing

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Crouse-Hinds; brand of Eaton, Electrical Sector.
c. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

A. Description: Hubs with certified grounding or bonding locknut.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Grounding and Bonding Hub:

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Arlington Industries, Inc.
c. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
d. Crouse-Hinds; brand of Eaton, Electrical Sector.
e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
f. Penn-Union Corp.; subsidiary of Nesco, Inc.

2. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

A. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

B. UL KDER - Pressure-Type Grounding and Bonding Busbar Cable Connector:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. General Characteristics: Copper or copper alloy, for compression bonding of one or more conductor directly to copper busbar. Listed for direct burial.

C. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Chatsworth Products, Inc.
d. Greaves Corp.; Essex Products Group, Inc.
e. ILSCO.

2. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.

D. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Harger Lightning & Grounding; business of Harger, Inc.
d. ILSCO.

2. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.

E. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. ILSCO.
d. a ll G Fabrication (formerly ALT).

2. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

a. Tinned copper, C and H shaped.

2.6 GROUNDING AND BONDING BUSBARS

A. Description: Miscellaneous grounding and bonding device that serves as common connection for multiple grounding and bonding conductors.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Equipment Room Grounding and Bonding Busbar:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Burndy; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
b. Chatsworth Products, Inc.
c. Cooper B-line; brand of Eaton, Electrical Sector.
d. ERICO; brand of nVent Electrical plc.
e. Harger Lightning & Grounding; business of Harger, Inc.
f. Hoffman; brand of nVent Electrical plc.
g. ILSCO.
h. Panduit Corp.

2. General Characteristics:

a. Bus: Rectangular bar of annealed copper.
b. Mounting Stand-Off Insulators: Lexan or PVC.

1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

3. Options:

a. Dimensions: 1/4 by 4 inch in cross section; length as .required.
b. Mounting Hardware: Stand-off brackets that provide 4 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

D. UL KDER - Rack and Cabinet Bonding Busbar:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Chatsworth Products, Inc.
b. Cooper B-line; brand of Eaton, Electrical Sector.
c. Harger Lightning & Grounding; business of Harger, Inc.
d. Hoffman; brand of nVent Electrical plc.
e. Panduit Corp.

2. General Characteristics:

a. Bus: Rectangular bar of hard-drawn solid copper.
b. Horizontal Mounting Dimensions: Designed for mounting in 19 inch wide equipment racks or cabinets.
c. Vertical Mounting Dimensions: Designed for mounting in 72 inch high equipment racks or cabinets.
d. Predrilled Hole Pattern: Accepts connectors for grounding and bonding conductor sizes 14 AWG to 2/0 AWG.
e. Mounting Hardware: Stainless steel or copper-plated, for attachment to rack.

2.7 GROUNDING (EARTHING) ELECTRODES

A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Rod Electrode:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
c. ERICO; brand of nVent Electrical plc.
d. Galvan Industries, Inc.; Electrical Products Division, LLC.
e. Harger Lightning & Grounding; business of Harger, Inc.

2. General Characteristics: Copper-clad steel;.

D. UL KDER - Plate Electrode:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ALLTEC LLC.
b. Galvan Industries, Inc.; Electrical Products Division, LLC.

2. General Characteristics: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.

B. Inspect test results of grounding system measured at point of electrical service equipment connection.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF BUSBARS

A. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

3.3 SELECTION OF GROUNDING AND BONDING CONDUCTORS

A. Conductors: Install solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger unless otherwise indicated.

B. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.

C. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.

D. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.

E. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

F. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.

G. Underground Grounding Conductors: Install bare tinned-copper conductor, 2/0 AWG minimum.

1. Bury at least 30 inch below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

3.4 SELECTION OF CONNECTORS

A. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.5 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Conductors:

a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

2. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
b. Make connections with clean, bare metal at points of contact.
c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.

e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.

g. Grounding and Bonding for Piping:

1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.

3. Electrodes:

a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.

1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2) Use exothermic welds for below-grade connections.

b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.

c. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and must be at least 12 inch deep, with cover.

1) Install at least one test well for each service unless otherwise indicated. Install at ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

d. Concrete-Encased Electrode (Ufer Ground):

1) Fabricate in accordance with NFPA 70; use minimum of 20 ft of bare copper conductor not smaller than 4 AWG.

a) If concrete foundation is less than 20 ft long, coil excess conductor within base of foundation.
b) Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

2) Fabricate in accordance with NFPA 70; using electrically conductive coated steel reinforcing bars or rods, at least 20 ft long. If reinforcing is in multiple pieces, connect together by usual steel tie wires or exothermic welding to create required length.

4. Grounding at Service:

a. Equipment grounding conductors and grounding electrode conductors must be connected to ground bus. Install main bonding jumper between neutral and ground buses.

5. Grounding Underground Distribution System Components:

a. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.
b. Comply with IEEE C2 grounding requirements.
c. Grounding Manholes and Handholes: Install driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inch below concrete. Seal floor opening with waterproof, nonshrink grout.
d. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields in accordance with manufacturer's published instructions with splicing and termination kits.

e. Pad-Mounted Transformers and Switches: Install two ground rods and ring electrode around pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ring electrode and for taps to equipment grounding terminals. Bury ring electrode not less than 6 inch from foundation.

6. Equipment Grounding:

a. Install insulated equipment grounding conductors with feeders and branch circuits.
b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1) Feeders and branch circuits.
2) Lighting circuits.
3) Receptacle circuits.
4) Single-phase motor and appliance branch circuits.
5) Three-phase motor and appliance branch circuits.
6) Flexible raceway runs.
7) Armored and metal-clad cable runs.
8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9) X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
e. Isolated Grounding Receptacle Circuits: Install insulated equipment grounding conductor connected to receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
f. Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of applicable derived system or service unless otherwise indicated.
g. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
h. Metallic Fences: Comply with requirements of IEEE C2.

1) Grounding Conductor: Bare, tinned copper, not less than 8 AWG.
2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
3) Barbed Wire: Strands must be bonded to grounding conductor.

7. Fence Grounding: Install at maximum intervals of 1500 ft except as follows:

a. Fences within 100 ft of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of 750 ft.

1) Gates and Other Fence Openings: Ground fence on each side of opening.

a) Bond metal gates to gate posts.
b) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use 2 AWG wire and bury it at least 18 inch below finished grade.

b. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at maximum distance of 150 ft on each side of crossing.
c. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inch below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.
d. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
e. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground fence and bond fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.6 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before conductors are connected.

a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.

c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:

a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω.

3.7 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel slotted support systems.
2. Conduit and cable support devices.
3. Support for conductors in vertical conduit.
4. Structural steel for fabricated supports and restraints.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
6. Fabricated metal equipment support assemblies.

1.2 INFORMATIONAL SUBMITTALS

A. Welding certificates.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified structural professional engineer to design hanger and support system.

B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame Rating: Class 1.
2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. CADDY; brand of nVent Electrical plc.

d. Cooper B-line; brand of Eaton, Electrical Sector.
e. Flex-Strut Inc.
f. Haydon Corporation.
g. Unistrut; Atkore International.

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers or equal: Subject to compliance with requirements:

1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
3) MKT Fastening, LLC.
4) Simpson Strong-Tie Co., Inc.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers or equal: Subject to compliance with requirements:

1) Cooper B-line; brand of Eaton, Electrical Sector.

2) Empire Industries, Inc.
3) Hilti, Inc.
4) ITW Ramset/Red Head; Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.
6. Toggle Bolts: Stainless steel springhead type.
7. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 SELECTION

A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA NEIS 101
2. NECA NEIS 102.
3. NECA NEIS 105.
4. NECA NEIS 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."

D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as scheduled in NECA NEIS 1, where its Table 1 lists maximum spacings that are less than those stated in NFPA 70. Minimum rod size must be 1/4 inch in diameter.

E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slottedsupport system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 INSTALLATION OF SUPPORTS

A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

END OF SECTION 260529

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type EMT-S duct raceways and elbows.
2. Type HDPE and Type EPEC duct raceways and fittings.
3. Type FMC-S and Type FMC-A duct raceways.
4. Type IMC duct raceways.
5. Type LFMC duct raceways.
6. Type LFNC duct raceways.
7. Type PVC duct raceways and fittings.
8. Fittings for conduit, tubing, and cable.
9. Electrically conductive corrosion-resistant compounds for threaded conduit.
10. Solvent cements.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

C. Related Requirements:
1. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" for nonmetallic underground conduit with conductors (Type NUCC).
2. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior duct banks, manholes, and underground utility construction.

1.2 DEFINITIONS

A. Conduit: A structure containing one or more duct raceways.

B. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data:
1. Type EMT-S duct raceways and elbows.
2. Type HDPE and Type EPEC duct raceways and fittings.
3. Type FMC-S and Type FMC-A duct raceways.
4. Type FMT duct raceways.
5. Type IMC duct raceways.
6. Type LFMC duct raceways.
7. Type LFNC duct raceways.
8. Type PVC duct raceways and fittings.
9. Fittings for conduit, tubing, and cable.

10. Electrically conductive corrosion-resistant compounds for threaded conduit.
11. Solvent cements.

B. Sustainable design submittals.

1. Solvent cements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:
1. Type EMT-S duct raceways and elbows.
2. Type HDPE and Type EPEC duct raceways and fittings.
3. Type FMC-S and Type FMC-A duct raceways.
4. Type IMC duct raceways.
5. Type LFMC duct raceways.
6. Type LFNC duct raceways.
7. Type PVC duct raceways and fittings.
8. Fittings for conduit, tubing, and cable.
9. Electrically conductive corrosion-resistant compounds for threaded conduit.
10. Solvent cements.

PART 2 - PRODUCTS

2.1 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FJMX; including UL 797.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Allied Tube & Conduit; Atkore International.
b. Calconduit; Atkore International.
c. Emerson Electric Co., Automation Solutions.
d. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
e. Western Tube; Zekelman Industries.

f. Wheatland Tube; Zekelman Industries.

2. Material: Steel.
3. Options:

a. Exterior Coating: Zinc.
b. Interior Coating: Zinc with organic top coating.
c. Minimum Trade Size: Metric designator 16 (trade size 1/2).
d. Colors: As indicated on Drawings.

2.2 TYPE ENT DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FKHU; including UL 1653.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FKHU - Electrical Nonmetallic Tubing (ENT) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Cantex Inc.
c. JM Eagle.

2. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Fittings:

1) Mechanically Attached Fittings: UL 1653.
2) Solvent-Attached Fittings: UL 651.

2.3 TYPE HDPE AND TYPE EPEC DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN EAZX; including UL 651A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL EAZX - Schedule 40 Electrical HDPE Underground Conduit (HDPE-40):

1. Manufacturers or equal: Subject to compliance with requirements:

a. Blue Diamond Industries, LLC.
b. JM Eagle.
c. Petroflex North America.
d. Prysmian Cables and Systems; Prysmian Group North America.
e. Southwire Company, LLC.

2. Dimensional Specifications: Schedule 40.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

D. UL EAZX - Schedule 80 Electrical HDPE Underground Conduit (HDPE-80):

1. Manufacturers or equal: Subject to compliance with requirements:

a. Blue Diamond Industries, LLC.
b. JM Eagle.
c. Petroflex North America.
d. Prysmian Cables and Systems; Prysmian Group North America.
e. Southwire Company, LLC.

2. Dimensional Specifications: Schedule 80.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

E. UL EAZX - Type A Electrical HDPE Underground Conduit (EPEC-A):
1. Dimensional Specifications: Type A.
2. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

F. UL EAZX - Type B Electrical HDPE Underground Conduit (EPEC-B):
1. Dimensional Specifications: Type B.
2. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.4 TYPE FMC-S DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DXUZ; including UL 1.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):

1. Manufacturers or equal: Subject to compliance with requirements: following:
   a. ABB, Electrification Business.
   b. Anaconda Sealtite; Anamet Electrical, Inc.
   c. Electri-Flex Company.
   d. International Metal Hose Co.
   e. Topaz Lighting & Electric.
2. Material: Steel.
3. Options:
   a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
   b. Colors: As indicated on Drawings.

2.5 TYPE IMC DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DYBY; including UL 1242.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DYBY - Steel Intermediate Metal Conduit (IMC):

1. Manufacturers or equal: Subject to compliance with requirements:

    a. ABB, Electrification Business.
    b. Allied Tube & Conduit; Atkore International.
    c. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    d. Western Tube; Zekelman Industries.
    e. Wheatland Tube; Zekelman Industries.

2. Options:

    a. Exterior Coating: Zinc.
    b. Interior Coating: Zinc with organic top coating.
    c. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    d. Colors: As indicated on Drawings.

2.6 TYPE LFMC DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DXHR; including UL 360.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. Manufacturers or equal: Subject to compliance with requirements:

    a. ABB, Electrification Business.
    b. Anaconda Sealtite; Anamet Electrical, Inc.
    c. Electri-Flex Company.
    d. International Metal Hose Co.

2. Material: Steel.
3. Options:

    a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    b. Colors: As indicated on Drawings.

2.7 TYPE LFNC DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DXOQ; including UL 1660.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXOQ - Layered (Type A) Liquidtight Flexible Nonmetallic Conduit (LFNC-A):

1. Manufacturers or equal: Subject to compliance with requirements:

   a. AFC Cable Systems; Atkore International.
   b. Electri-Flex Company.
   c. Topaz Lighting & Electric.

2. Additional Criteria: Type A conduit with smooth seamless inner core and cover bonded together with one or more reinforcement layers between core and cover.
3. Options:

   a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
   b. Colors: As indicated on Drawings.
   c. Markings: Outdoor.

D. UL DXOQ - Integral (Type B) Liquidtight Flexible Nonmetallic Conduit (LFNC-B):

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Cambridge Resources.
   b. Electri-Flex Company.
   c. Superflex Ltd.
   d. Topaz Lighting & Electric.

2. Additional Criteria: Type B conduit with smooth inner surface with integral reinforcement within conduit wall.
3. Options:

   a. Minimum Trade Size: Metric designator 16 (trade size 1/2).
   b. Colors: As indicated on Drawings.
   c. Markings: 80 deg C dry.

2.8 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DZYR; including UL 651.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DZYR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. ABB, Electrification Business.
    b. Calconduit; Atkore International.
    c. Champion Fiberglass, Inc.
    d. NAPCO; Westlake Chemical Corp.
    e. Opti-Com Manufacturing Network, Inc (OMNI).
    f. Topaz Lighting & Electric.

2. Dimensional Specifications: Schedule 40.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    b. Markings: For directional boring applications.

D. UL DZYR - Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. ABB, Electrification Business.
    b. Calconduit; Atkore International.
    c. JM Eagle.
    d. Opti-Com Manufacturing Network, Inc (OMNI).
    e. Topaz Lighting & Electric.

2. Dimensional Specifications: Schedule 80.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
    b. Markings: For directional boring applications.

E. UL DZYR - Type A Rigid PVC Concrete-Encased Conduit (PVC-A) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. Southern Pipe, Inc.

2. Dimensional Specifications: Type A.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

F. UL DZYR - Type EB Rigid PVC Concrete-Encased Underground Conduit (PVC-EB) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. JM Eagle.
    b. Southern Pipe, Inc.

2. Dimensional Specifications: Type EB.
3. Options:

    a. Minimum Trade Size: Metric designator 78 (trade size 3)FITTINGS FOR CONDUIT, TUBING, AND CABLE

G. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

H. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

I. UL DWTT - Fittings for Type ERMC, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:

1. Manufacturers or equal: Subject to compliance with requirements:

    a. ABB, Electrification Business.
    b. Appleton; Emerson Electric Co., Automation Solutions.
    c. Crouse-Hinds; brand of Eaton, Electrical Sector.
    d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
    e. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    f. Southwire Company, LLC.

2. Listing Criteria: UL CCN DWTT; including UL 514B.
3. Options:

    a. Material: Steel.
    b. Coupling Method: Raintight compression coupling with distinctive color gland nut.

c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

J. UL FKAV - Fittings for Type EMT Duct Raceways:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. Appleton; Emerson Electric Co., Automation Solutions.
d. Crouse-Hinds; brand of Eaton, Electrical Sector.
e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
g. Southwire Company, LLC.

2. Listing Criteria: UL CCN FKAV; including UL 514B.
3. Options:

a. Material: Steel.
b. Coupling Method: Setscrew coupling. Setscrew couplings with only single screw per conduit are unacceptable.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

K. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Manufacturers or equal: Subject to compliance with requirements:

a. American Fittings Corp. (AMFICO).
b. Liquid Tight Connector Co.
c. Southwire Company, LLC.

2. Listing Criteria: UL CCN ILNR; including UL 514B.

L. UL DXAS - Fittings for Type LFMC and Type LFNC Duct Raceways:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Liquid Tight Connector Co.

2. Listing Criteria: UL CCN DXAS; including UL 514B.

2.9 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

1. Manufacturers or equal: Subject to compliance with requirements: following:

a. ABB, Electrification Business.

2.10 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN DWTT; including UL 514B.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation:

3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DWTT - Solvent Cements for Type PVC Duct Raceways and Fittings:

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

B. Special Instructions Regarding HDPE Conduits: Although Article 353 of NFPA 70 permits use of HDPE conduits where encased in concrete aboveground, UL CCN EAZX listing requirements state that HDPE and EPEC underground conduits are intended only for use where direct buried with or without being encased in concrete. Specified Type HDPE underground conduits are not permitted to be used aboveground on Project.

C. Outdoors:

1. Exposed and Subject to Severe Physical Damage: ERMC.
2. Exposed and Subject to Physical Damage: ERMC.

    a. Locations less than 2.5 m (8 ft) above finished floor.

3. Exposed and Not Subject to Physical Damage: ERMC.
4. Concealed Aboveground: IMC.
5. Direct Buried: PVC-80.
6. Concrete Encased Not in Trench: PVC-40.
7. Concrete Encased in Trench:PVC-40]
8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:
1. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
2. Type HDPE and Type EPEC: Article 353 of NFPA 70 and NECA NEIS 111.
3. Type ERMC-A: Article 344 of NFPA 70 and NECA NEIS 102.
4. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
5. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
6. Type FMC-A: Article 348 of NFPA 70 and NECA NEIS 102.
7. Type IMC: Article 342 of NFPA 70 and NECA NEIS 101.
8. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
9. Type LFNC: Article 342 of NFPA 70 and NECA NEIS 111.
10. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
11. Expansion Fittings: NEMA FB 2.40.
12. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

    a. Complete duct raceway installation before starting conductor installation.
    b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
    c. Install no more than equivalent of three 90-degree bends in conduit run except for control wiring conduits, for which no more than equivalent of two 90-degree fewer bends are permitted. Support within 12 inch of changes in direction.
    d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
    e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

f. Support conduit within 12 inch of enclosures to which attached.
g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:

1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2) Where an underground service duct raceway enters a building or structure.
3) Conduit extending from interior to exterior of building.
4) Conduit extending into pressurized duct raceway and equipment.
5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6) Where otherwise required by NFPA 70.

i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
j. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
k. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.

1) Termination fittings with shoulders do not require two locknuts.

o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts..

2. Types ERMC and IMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.

3. Type ERMC-S-PVC:

a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERMC-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERMC-S-PVC duct raceway.
c. Coat field-cut threads on PVC-coated duct raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.

4. Types FMC, LFMC, and LFNC:

a. Provide a maximum of 72 inch of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

5. Types PVC, HDPE, and EPEC:

a. Do not install Type PVC, Type HDPE, or Type EPEC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
b. Comply with manufacturer's published instructions for solvent welding and fittings.

6. Stub-ups to Above Recessed Ceilings:

a. Provide EMT, IMC, or ERMC for duct raceways.
b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

7. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG..

8. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

a. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
b. EMT: Provide setscrew, fittings. Comply with NEMA FB 2.10.
c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

9. Expansion-Joint Fittings:

a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that

exceeds 25 ft. Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.

b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
4) Attics: 135 deg F temperature change.

c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
d. Install expansion fittings at locations where conduits cross building or structure expansion joints.
e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

10. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
11. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.

a. Provide warning signs.

D. Interfaces with Other Work:

1. Coordinate with Section 078413 "Penetration Firestopping" for installation of firestopping at penetrations of fire-rated floor and wall assemblies.
2. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533.13

SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

B. Shop Drawings:

1. Shop drawings for floor boxes.

C. Sustainable design submittals.
1. Junction boxes and pull boxes.
2. Cover plates for device boxes.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.

PART 2 - PRODUCTS

2.1 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN QCIT; including UL 514A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
3. Samples:

a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
b. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

C. UL QCIT - Metallic Outlet Boxes and Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

2. Options:

a. Material: Sheet steel.
b. Sheet Metal Depth: Minimum 1.5 inch.
c. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb.

D. UL QCIT - Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

2. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Appleton; Emerson Electric Co., Automation Solutions.
c. Crouse-Hinds; brand of Eaton, Electrical Sector.
d. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
e. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
f. Pass & Seymour; Legrand North America, LLC.
g. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
h. Topaz Lighting & Electric.

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.

2. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Appleton; Emerson Electric Co., Automation Solutions.
c. Arlington Industries, Inc.
d. Crouse-Hinds; brand of Eaton, Electrical Sector.
e. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
f. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
g. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
h. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
i. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

3. Options:

a. Material: Sheet steel.
b. Sheet Metal Depth: minimum 1.5 inch.

F. UL QCIT - Metallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both. provide products by one of the

2. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Appleton; Emerson Electric Co., Automation Solutions.
c. Cooper B-line; brand of Eaton, Electrical Sector.
d. Crouse-Hinds; brand of Eaton, Electrical Sector.
e. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
f. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
g. Pass & Seymour; Legrand North America, LLC.

h. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

G. UL QCIT - Metallic Floor Boxes and Floor Box Covers:

1. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure.

2. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Arlington Industries, Inc.
c. Arlington Industries, Inc.
d. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
e. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
f. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
g. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
h. Leviton Manufacturing Co., Inc.
i. Pass & Seymour; Legrand North America, LLC.
j. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

H. UL QCIT - Metallic Recessed Access-Floor Boxes and Recessed Floor Box Covers:

1. Description: Floor box with provisions for mounting wiring devices below floor surface and floor box cover with provisions for passage of cords to recessed wiring devices mounted within floor box.

2. Manufacturers or equal: Subject to compliance with requirements:

a. FSR Inc.
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
d. Wiremold; Legrand North America, LLC.

2.2 JUNCTION BOXES AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN BGUZ; including UL 50 and UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation for adhesive solvents:

3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Manufacturers or equal: Subject to compliance with requirements:

   a. Adalet.
   b. Appleton; Emerson Electric Co., Automation Solutions.
   c. Cooper B-line; brand of Eaton, Electrical Sector.
   d. FSR Inc.
   e. Hoffman; brand of nVent Electrical plc.
   f. Hubbell Industrial Controls; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
   g. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
   h. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

3. Options:

   a. Degree of Protection: Type 1.

D. UL BGUZ - Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Manufacturers or equal: Subject to compliance with requirements:

   a. Adalet.
   b. Appleton; Emerson Electric Co., Automation Solutions.
   c. Crouse-Hinds; brand of Eaton, Electrical Sector.
   d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.

3. Options:

   a. Degree of Protection: Type 1.

E. UL BGUZ - Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

2. Manufacturers or equal: Subject to compliance with requirements:

   a. Adalet.
   b. Appleton; Emerson Electric Co., Automation Solutions.
   c. Crouse-Hinds; brand of Eaton, Electrical Sector.
   d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.

3. Options:

   a. Degree of Protection: Type 3R.

2.3 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Wallplate-Securing Screws: Metal with head color to match wallplate finish.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation for adhesive solvents.
3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. ABB, Electrification Business.
   b. Appleton; Emerson Electric Co., Automation Solutions.
   c. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
   d. Crouse-Hinds; brand of Eaton, Electrical Sector.
   e. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
   f. Leviton Manufacturing Co., Inc.
   g. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
   h. Panduit Corp.
   i. Pass & Seymour; Legrand North America, LLC.
   j. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2. Options:

a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
b. Wallplate Material: As indicated on architectural Drawings.

D. UL QCIT or QCMZ - Nonmetallic Cover Plates for Device Boxes:

1. Manufacturers or equal: Subject to compliance with requirements:

a. ABB, Electrification Business.
b. Appleton; Emerson Electric Co., Automation Solutions.
c. Arlington Industries, Inc.
d. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
e. Crouse-Hinds; brand of Eaton, Electrical Sector.
f. Hubbell Premise Wiring; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
g. Leviton Manufacturing Co., Inc.
h. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
i. Panduit Corp.
j. Pass & Seymour; Legrand North America, LLC.

2. Options:

a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
b. Wallplate Material: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device.
c. Color: White.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thicknesswhere boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

3.2 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

a. Type 3R.
b. Locations Exposed to Hosedown: Type 4.
c. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.

2. Indoors:

a. Type 1 unless otherwise indicated.
b. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
c. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
d. Locations Exposed to Corrosive Agents: Type 4X.
e. Locations Exposed to Spraying Oil or Coolants: Type 13.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

1. Provide cast-metal boxes. subject to damage.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
2. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to bottom of box unless otherwise indicated.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

    a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    b. Provide gaskets for wallplates and covers.

14. Identification: Provide labels for boxes and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each box with engraved metal or laminated-plastic nameplate.

3.4 PROTECTION

A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.16

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EPEC raceways and fittings.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type IMC raceways.
4. Type PVC raceways and fittings.
5. Fittings for conduit, tubing, and cable.
6. Threaded metal joint compound.
7. Solvent cements.
8. Duct accessories.
9. Handholes and boxes for exterior underground wiring.
10. Manholes for exterior underground wiring.
11. Duct sealing.

B. Related Requirements:
1. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" for nonmetallic underground conduit with conductors (Type NUCC).

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Preinstallation Coordination Meeting(s): For underground ducts and raceways. Conduct meeting(s) at Project site before. Roughing.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Duct-bank materials, including spacers and miscellaneous components.
2. Ducts, conduits, and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes.
4. Underground-line warning tape.

B. Shop Drawings:

1. Precast or Factory-Fabricated Concrete Structures:

a. Include plans, elevations, sections, and details, including attachments to other Work.

b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
c. Include reinforcement details.
d. Include frame and cover design and manhole chimneys.
e. Include grounding details.
f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, sumps, and other accessories.
g. Include joint details.

2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes, and methods and materials for waterproofing duct entry locations.
c. Include cover design.
d. Include grounding details.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

PART 2 - PRODUCTS

2.1 TYPE EPEC RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651A and UL CCN EAZX.

B. Schedule 40 Electrical HDPE Underground Conduit (EPEC-40):

1. Manufacturers or equal: Subject to compliance with requirements.

a. Blue Diamond Industries, LLC.
b. JM Eagle.
c. Petroflex North America.
d. Prysmian Cables and Systems; Prysmian Group North America.
e. Southwire Company, LLC.

2. Dimensional Specifications: Schedule 40.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

C. Schedule 80 Electrical HDPE Underground Conduit (EPEC-80):

1. Manufacturers or equal: Subject to compliance with requirements.

    a. Blue Diamond Industries, LLC.
    b. JM Eagle.
    c. Petroflex North America.
    d. Prysmian Cables and Systems; Prysmian Group North America.
    e. Southwire Company, LLC.

2. Dimensional Specifications: Schedule 80.
3. Options:

    a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

2.2 TYPE ERMC-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 6 and UL CCN DYIX.

B. Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Manufacturers or equal: Subject to compliance with requirements.

    a. Allied Tube & Conduit; Atkore International.
    b. Crouse-Hinds; brand of Eaton, Electrical Sector.
    c. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
    d. Patriot Aluminum Products, LLC.
    e. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
    f. Topaz Lighting & Electric.
    g. Western Tube; Zekelman Industries.
    h. Wheatland Tube; Zekelman Industries.

2. Exterior Coating: Zinc.
3. Options:

    a. Interior Coating: Zinc.
    b. Minimum Trade Size: Metric designator 16 (trade size 1/2).
    c. Colors: As indicated on Drawings.

2.3 TYPE IMC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2. General Characteristics: UL 1242 and UL CCN DYBY.

B. Steel Electrical Intermediate Metal Conduit (IMC):

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Allied Tube & Conduit; Atkore International.
c. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
d. Topaz Lighting & Electric.
e. Western Tube; Zekelman Industries.
f. Wheatland Tube; Zekelman Industries.

2. Options:

a. Exterior Coating: Zinc.
b. Interior Coating: Zinc.
c. Minimum Trade Size: Metric designator 16 (trade size 1/2).
d. Colors: As indicated on Drawings.

2.4 TYPE PVC RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL 651 and UL CCN DZYR.

B. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Calconduit; Atkore International.
c. JM Eagle.
d. NAPCO; Westlake Chemical Corp.
e. Opti-Com Manufacturing Network, Inc (OMNI).
f. Topaz Lighting & Electric.

2. Dimensional Specifications: Schedule 40.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Markings: For directional boring applications.

C. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Calconduit; Atkore International.
c. JM Eagle.
d. Opti-Com Manufacturing Network, Inc (OMNI).
e. Topaz Lighting & Electric.

2. Dimensional Specifications: Schedule 80.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).
b. Markings: For directional boring applications.

D. Type A Rigid PVC Concrete-Encased Conduit (PVC-A) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Southern Pipe, Inc.

2. Dimensional Specifications: Type A.
3. Options:

a. Minimum Trade Size: Metric designator 21 (trade size 3/4).

DI. Type EB Rigid PVC Concrete-Encased Underground Conduit (PVC-EB) and Fittings:

1. Manufacturers or equal: Subject to compliance with requirements.

a. JM Eagle.
b. Southern Pipe, Inc.

2. Dimensional Specifications: Type EB.
3. Options:

a. Minimum Trade Size: Metric designator 53 (trade size 2)FITTINGS FOR CONDUIT, TUBING, AND CABLE

DII. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

DIII. Metallic Fittings for Type ERMC, Type IMC, Type PVC, Type EPEC, and Type RTRC Raceways:

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.
b. Appleton; Emerson Electric Co., Automation Solutions.
c. Crouse-Hinds; brand of Eaton, Electrical Sector.

d. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
e. Penn Aluminum Conduit & EMT; Penn Aluminum International LLC; Berkshire Hathaway.
f. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
g. Southwire Company, LLC.
h. Topaz Lighting & Electric.

2. General Characteristics: UL 514B and UL CCN DWTT.
3. Options:

a. Material: Steel.
b. Coupling Method: Compression coupling.
c. Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

2.5 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: UL Subject 2419 and UL CCN FOIZ.

B. Manufacturers or equal: Subject to compliance with requirements.

1. ABB, Electrification Business.

2.6 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics: As recommended by conduit manufacturer in accordance with UL 514B and UL CCN DWTT.

B. Solvent Cements for Type PVC Raceways and Fittings:

2.7 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

1. Manufacturers or equal: Subject to compliance with requirements.

a. ABB, Electrification Business.

b. Allied Tube & Conduit; Atkore International.
c. Cantex Inc.
d. IPEX USA LLC.
e. PenCell Plastics; brand of Hubbell Utility Solutions; Hubbell Incorporated.

B. Underground-Line Warning Tape: In accordance with Section 260553 "Identification for Electrical Systems."

2.8 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:

a. ASTM C858 for design and manufacturing processes.
b. SCTE 77.

B. Source Quality Control:

1. Precast Concrete Utility Structures: Test and inspect in accordance with ASTM C1037.
2. Polymer Concrete and Nonconcrete Handhole and Pull-Box Prototypes: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests must be for specified tier ratings of products supplied. Testing machine pressure gages must have current calibration certification, complying with ISO 9000 and ISO 10012, and traceable to NIST standards.
   a. Strength tests of complete boxes and covers must be by independent testing agency or manufacturer. Qualified registered professional engineer must certify tests by manufacturer.

C. Precast Concrete Handholes and Boxes:

1. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover must form top of enclosure and must have load rating consistent with that of handhole or box.

2. Manufacturers or equal: Subject to compliance with requirements.

a. Elmhurst-Chicago Stone Co.
b. Oldcastle Infrastructure Inc.; CRH Americas.
c. Riverton Concrete Products.
d. Utility Concrete Products, LLC.
e. Utility Vault Co.
f. Wausau Tile, Inc.

3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Frame and Cover:

a. Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.
b. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
c. Cover Legend: Molded lettering, as indicated for each service.

5. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.

a. Extension must provide increased depth of 12 inch.
b. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
7. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch vertically and horizontally to accommodate alignment variations.
8. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
9. Handholes 12 inch wide by 24 inch long and larger must have inserts for cable racks and pulling-in irons installed before concrete is poured.

D. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:

1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.

2. Manufacturers or equal: Subject to compliance with requirements.

a. Armorcast Products Company; brand of Hubbell Utility Solutions; Hubbell Incorporated.
b. MacLean Highline.
c. NewBasis.
d. Oldcastle Infrastructure Inc.; CRH Americas.
e. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated.

3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.

a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
b. Cover Legend: Molded lettering, as indicated for each service.

5. Conduit Entrance Provisions: Conduit-terminating fittings must mate with entering ducts for secure, fixed installation in enclosure wall.
6. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
7. Handholes 12 inch wide by 24 inch long and larger must have factory-installed inserts for cable racks and pulling-in irons.

8. Options:

    a. Color: Gray.

E. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover:

1. Description: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

2. Manufacturers or equal: Subject to compliance with requirements.

    a. Armorcast Products Company; brand of Hubbell Utility Solutions; Hubbell Incorporated.
    b. NewBasis.
    c. Oldcastle Infrastructure Inc.; CRH Americas.
    d. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated.

3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

    a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
    b. Cover Legend: Molded lettering, as indicated for each service.
5. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
6. Handholes 12 inch wide by 24 inch long and larger must have factory-installed inserts for cable racks and pulling-in irons.
7. Options:

    a. Color: Gray.

F. Fiberglass Handholes and Boxes:

1. Description: Molded of fiberglass-reinforced polyester resin, with covers made of reinforced fiberglass.

2. Manufacturers or equal: Subject to compliance with requirements.

    a. MacLean Highline.
    b. Nordic Fiberglass, Inc.
    c. Oldcastle Infrastructure Inc.; CRH Americas.
    d. Quazite; brand of Hubbell Utility Solutions; Hubbell Incorporated.

3. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
b. Cover Legend: Molded lettering, as indicated for each service.

5. Duct Entrance Provisions: Duct-terminating fittings must mate with entering duct for secure, fixed installation in enclosure wall.
6. Handholes 12 inch wide by 24 inch long and larger must have factory-installed inserts for cable racks and pulling-in irons.
7. Options:

a. Color: Gray.

2.9 MANHOLES FOR EXTERIOR UNDERGROUND WIRING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. General Characteristics:

a. ASTM C858 for design and manufacturing processes.
b. SCTE 77.

B. Precast Concrete Manholes:

1. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.

2. Manufacturers or equal: Subject to compliance with requirements.

a. Carder Concrete Products.
b. Elmhurst-Chicago Stone Co.
c. Oldcastle Infrastructure Inc.; CRH Americas.
d. Rinker Group, Ltd.
e. Riverton Concrete Products.
f. Utility Concrete Products, LLC.
g. Utility Vault Co.
h. Wausau Tile, Inc.

3. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus additional 12 inch vertically and horizontally to accommodate alignment variations.
4. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.
5. Ground Rod Sleeve: Provide 3 inch PVC sleeve in manhole floors 2 inch from wall adjacent to, but not underneath, duct entering structure.
6. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at installation location with ground-water level at grade.
7. Source Quality Control: Test and inspect in accordance with ASTM C1037.

C. Cast-In-Place Concrete Manholes:

1. Description: Underground utility structures, constructed in place, complete with accessories, hardware, and features. Include concrete knockout panels for duct entrance and sleeve for ground rod.
2. Additional Criteria: Comply with Section 033000 "Cast-in-Place Concrete."

2.10 DUCT SEALING

A. Manufacturers or equal: Subject to compliance with requirements.

1. ABB, Electrification Business.
2. Gardner Bender.
3. Ideal Industries, Inc.
4. NSi Industries LLC.
5. TE Connectivity Ltd.

B. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Compound must be capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.

C. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field. Notify Architect if there is conflict between areas of excavation and existing structures or archaeological sites to remain.

B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Architect.

3.2 SELECTION OF UNDERGROUND DUCTS

A. Duct for Electrical Feeders: PVC-40, unless otherwise indicated.

B. Duct for Electrical Branch Circuits: PVC-40, direct buried unless otherwise indicated.

C. Bored Underground Duct: EPEC-80 unless otherwise indicated.

D. Underground Ducts Crossing Paved Paths: PVC-40.

E. Underground Ducts Crossing Roadways: PVC-40, encased in reinforced concrete.

F. Stub-ups: Concrete encased, PVC-40.

3.3 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Restore area after construction vehicle traffic in immediate area is complete.

C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 329200 "Turf and Grasses" and Section 329300 "Plants."

E. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures in accordance with "Cutting and Patching" Article in Section 017300 "Execution."

3.4 INSTALLATION OF DUCTS AND DUCT BANKS

A. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA TCB 2 for installation of underground ducts and duct banks.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Where indicated on Drawings, install duct, spacers, and accessories into duct-bank configuration shown. Duct installation requirements in this Section also apply to duct bank.
2. Steel raceway, bends, and fittings in on Project must be of same type.
3. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.
4. Expansion and Deflection Fittings: Install expansion and deflection fitting in each duct in area of disturbed earth adjacent to manhole or handhole.
5. Install expansion fitting near center of straight line duct with calculated expansion of more than 3/4 inch.
6. Curves and Bends:

a. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with minimum radius of 48 inch, both horizontally and vertically, at other locations unless otherwise indicated.
b. Field bending must be in accordance with NFPA 70 minimum radii requirements, except bends over 45 degrees must be made with minimum radius of 48 inch. Use only equipment specifically designed for material and size involved. Use PVC heating bender for bending PVC conduit.
c. Duct must have maximum of 180 degrees of bends between pull points.

7. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with minimum 3 inch of concrete for minimum of 12 inch on each side of coupling.

    a. Install insulated grounding bushings on steel raceway terminations that are less than 12 inch below grade or floor level and do not terminate in hubs.

8. Installation Adjacent to High-Temperature Steam Lines: Where duct is installed parallel to underground steam lines, perform calculations showing duct will not be subject to environmental temperatures above 104 deg F. Where environmental temperatures are calculated to rise above 104 deg F, and anywhere duct crosses above underground steam line, install insulation blankets listed for direct burial to isolate duct bank from steam line to maintain maximum environmental temperature of 104 deg F.
9. End Bell Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inch o.c. for 5 inch duct, and vary proportionately for other duct sizes.

    a. Begin change from regular spacing to end-bell spacing 10 ft from end bell, without reducing duct slope and without forming trap in line.
    b. Grout end bells into structure walls from both sides to provide watertight entrances.

10. Duct Terminators for Entrances to Cast-in-Place Manholes and Concrete Handholes: Use manufactured, cast-in-place duct terminators, with entrances into structure spaced approximately 6 inch o.c. for 4 inch duct, and vary proportionately for other duct sizes.

    a. Begin change from regular spacing to terminator spacing 10 ft from terminator, without reducing duct line slope and without forming trap in line.

11. Building Wall Penetrations: Make transition from underground duct to steel raceway at least 10 ft outside building wall, without reducing duct line slope away from building and without forming trap in line. Use fittings manufactured for transition to steel raceway type installed. Install steel raceway penetrations of building walls as specified in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."
12. Sealing: Provide temporary closure at terminations of duct with pulled cables. Seal spare duct at terminations. Use sealing compound and plugs to withstand at least 15 psig hydrostatic pressure.
13. Pulling Cord: Install 200 lbf test nylon cord in empty ducts.
14. Concrete-Encased Ducts and Duct Bank:

a. Excavate trench bottom to provide firm and uniform support for duct. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes 6 inch or less in nominal diameter.
b. Width: Excavate trench 3 inch wider than duct on each side.
c. Depth: Install so top of duct envelope is at least 24 inch below finished grade in areas not subject to deliberate traffic, and at least 30 inch below finished grade in deliberate traffic paths for vehicles unless otherwise indicated. Install so top of duct envelope is below local frost line.
d. Support duct on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
e. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four] spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to duct to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
f. Minimum Space between Ducts: 3 inch between edge of duct and exterior envelope wall, 2 inch between ducts for like services, and 4 inch between power and communications ducts.

g. Stub-ups to Outdoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of equipment base.

    1) Stub-ups must be minimum 4 inch above finished floor and minimum 3 inch from conduit side to edge of slab.

h. Stub-ups to Indoor Equipment: Extend concrete-encased steel raceway horizontally minimum of 60 inch from edge of wall. Install insulated grounding bushings on terminations at equipment.

    1) Stub-ups must terminate in coupling installed flush with finished floor and no less than 3 inch from conduit side to edge of slab.
i. Reinforcement: Reinforce concrete-encased duct where crossing disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
j. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
k. Concrete Cover: Install minimum of 3 inch of concrete cover between edge of duct to exterior envelope wall, 2 inch between duct of like services, and 4 inch between power and communications ducts.
l. Place minimum 6 inch of engineered fill above concrete encasement of duct.
m. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between duct and at exterior surface of envelope. Do not allow heavy mass of concrete to fall directly onto ducts. Allow concrete to flow around duct and rise up in middle, uniformly filling open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-installation application.

15. Direct-Buried Duct and Duct Bank:

a. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
b. Width: Excavate trench 3 inch wider than duct on each side.
c. Depth: Install top of duct at least 36 inch below finished grade unless otherwise indicated.
d. Set elevation of top of duct bank below frost line.
e. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 6 inch above top level of duct.
f. Support ducts on duct spacers coordinated with duct size, duct spacing, and outdoor temperature.
g. Spacer Installation: Place spacers close enough to prevent sagging and deforming of duct, with not less than four spacers per 20 ft of duct. Place spacers within 24 inch of duct ends. Stagger spacers approximately 6 inch between tiers. Secure spacers to earth and to ducts to prevent floating during concreting. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
h. Install duct with minimum of 3 inch between ducts for like services and 6 inch between power and communications duct.
i. After installing first tier of duct, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inch over duct and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction. Comply with requirements in Section 312000 "Earth Moving" for installation of backfill materials.

16. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inch above concrete-encased duct and duct banks and approximately 12 inch below grade. Align tape parallel to and within 3 inch of centerline of duct bank. Provide additional warning tape for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional tapes 12 inch apart, horizontally across width of ducts.
17. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.5 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Reference Standards:

1. Precast Concrete Handholes: Comply with ASTM C891 unless otherwise indicated.
2. Consult Architect for resolution of conflicting requirements.

B. Special Techniques:

1. Cast-in-Place Manholes:

a. Finish interior surfaces with smooth-troweled finish.

b. Knockouts for Future Duct Connections: Form and pour concrete knockout panels 1-1/2 to 2 inch thick, arranged as indicated.
c. Comply with requirements in Section 033000 "Cast-in-Place Concrete" for cast-in-place concrete, formwork, and reinforcement.

2. Precast Concrete Handholes and Manholes:

a. Install units level and plumb and with orientation and depth coordinated with connecting duct to minimize bends and deflections required for proper entrances.
b. Unless otherwise indicated, support units on level bed of crushed stone or gravel graded from 1 inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
c. Field-cut openings for conduits in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3. Elevations:

a. Manhole Roof: Install with rooftop at least 15 inch below finished grade.
b. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch above finished grade.
c. Install handholes with bottom below frost line, below grade.
d. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch above finished grade.
e. Where indicated, cast handhole cover frame integrally with handhole structure.

4. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.
5. Manhole Access: Circular opening in manhole roof; sized to match cover size.

a. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
b. Install chimney, constructed of precast concrete collars and rings, and cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight joints and waterproof grouting for frame and chimney.

6. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.
7. Damp proofing: Apply damp proofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Damp proofing materials and installation are specified in Section 071113 "Bituminous Damp proofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.
8. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms,as required for installation and support of cables and conductors and as indicated.

9. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inch for manholes and 2 inch for handholes, for anchor bolts installed in field. Use minimum of two anchors for each cable stanchion.
10. Ground manholes, handholes, and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handholegrounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Nonconforming Work:

1. Underground ducts, raceways, and structures will be considered defective if they do not pass tests and inspections.
2. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Assemble and submit test and inspection reports.

END OF SECTION 260543

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Pourable sealants.
6. Foam sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Steel Wall Sleeves:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Advance Products & Systems, LLC.
   b. CCI Piping Systems.
   c. Flexicraft Industries.
   d. GPT; an EnPro Industries company.
   e.

2. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral waterstop.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Advance Products & Systems, LLC.
2. BWM Company.
3. CALPICO, Inc.
4. Flexicraft Industries.

5. GPT; a division of EnPRO Industries.
6. Metraflex Company (The).
7. Proco Products, Inc.

B. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

C. Options:

1. Sealing Elements: EPDM.
2. Pressure Plates: Carbon stee.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Manufacturers or equal: Subject to compliance with requirements:

1. HoldRite; Reliance Worldwide Company.

B. General Characteristics: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Manufacturers or equal: Subject to compliance with requirements:

1. W. R. Meadows, Inc.

B. General Characteristics: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.
b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:

1. Install steel pipe sleeves with integral waterstops. Size sleeves to allow for 1 inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.

3.2 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Restraints - rigid type.
3. Restraints - cable type.
4. Restraint accessories.
5. Post-Installed concrete anchors.
6. Concrete inserts.

B. Related Requirements:

1. .Retain subparagraph below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.
2. Section 260529 "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated load capacity for each seismic restraint device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic restraint component used.
3. Annotate types and sizes of seismic restraints and accessories, complete with listing markings or report numbers and load rating in tension and compression as evaluated by UL product listing
4. Annotate to indicate application of each product submitted and compliance with requirements.

B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

3. For each seismic-restraint device, including restraint - rigid and cable type, that is required by this Section or is indicated on Drawings, submit the following:

    a. Seismic Restraints: Select seismic restraints complying with performance requirements, design criteria, and analysis data.

b. Post-Installed Concrete Anchors and Inserts: Include calculations showing anticipated seismic loads. Include certification that device is approved by an NRTL for seismic reinforcement use.
c. Seismic Design Calculations: Submit input data and loading calculations prepared under "Seismic Design Calculations" Paragraph in "Performance Requirements" Article.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic- and Wind-Load-Restraint Device Load Ratings: Devices to be tested and rated in accordance with applicable code requirements and authorities having jurisdiction. Devices to be listed by a nationally recognized third party that requires periodic follow-up inspections and has a listing directory available to the public.Consequential Damage: Provide additional seismic-restraints for suspended electrical components or anchorage of floor-, roof-, or wall-mounted components so that failure of a non-essential or essential component will not cause failure of any other essential building component.

B. Fire/Smoke Resistance: Seismic-restraint devices that are not constructed of ferrous metals must have a maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL in accordance with ASTM E84 or UL 723, and be so labeled.

C. Component Supports:

1. Load ratings, features, and applications of reinforcement components must be based on testing standards of a nationally recognized testing agency.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Ace Mountings Co., Inc.
b. CADDY; brand of nVent Electrical plc.
c. California Dynamics Corporation.
d. Isolation Technology, Inc.
e. Kinetics Noise Control, Inc.
f. Korfund.
g. NOVIA; a division of Carpenter & Paterson.
h. Vibration Eliminator Co., Inc.
i. Vibration Isolation.

j. Vibration Management Corp.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties. Neoprene rubber, silicone rubber, or other elastomeric material.
5. Surface Pattern: Smooth, ribbed, or waffle pattern.

2.3 RESTRAINTS - RIGID TYPE

A. Manufacturers or equal: Subject to compliance with requirements:

1. CADDY; brand of nVent Electrical plc.
2. California Dynamics Corporation.
3. Cooper B-line; brand of Eaton, Electrical Sector.
4. Hilti, Inc.
5. Isolation Technology, Inc.
6. TOLCO Incorporated.
7. Unistrut; Atkore International.

B. Description: Shop- or field-fabricated bracing assembly made of ANSI/AISI S110-07-S1 slotted steel channels, ANSI/ASTM A53/A53M steel pipe, or other rigid steel brace member. Includes accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.4 RESTRAINTS - CABLE TYPE

A. Manufacturers or equal: Subject to compliance with requirements:

1. CADDY; brand of nVent Electrical plc.
2. Cooper B-line; brand of Eaton, Electrical Sector.
3. Gripple Inc.
4. Loos & Co. Inc.
5. VMC GROUP.

B. Seismic-Restraint Cables: ASTM A1023/A1023M galvanized or ASTM A603 galvanized-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for seismic-restraining cable service; with fittings attached by means of poured socket, swaged socket, or mechanical (Flemish eye) loop.

C. Restraint cable assembly and cable fittings must comply with ASCE/SEI 19. Cable fittings and complete cable assembly must maintain the minimum cable breaking force. U-shaped cable clips and wedge-type end fittings do not comply and are unacceptable.

2.5 RESTRAINT ACCESSORIES

A. Manufacturers or equal: Subject to compliance with requirements:

1. CADDY; brand of nVent Electrical plc.
2. Cooper B-line; brand of Eaton, Electrical Sector.
3. Hilti, Inc.
4. Loos & Co. Inc.
5. Mason Industries, Inc.
6. TOLCO Incorporated.
7. Unistrut; Atkore International.

B. Hanger-Rod Stiffener: to hanger rod. Non-metallic stiffeners are unacceptable.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

2.6 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Cooper B-line; brand of Eaton, Electrical Sector.
b. Hilti, Inc.
c. Mason Industries, Inc.
d. Powers Fasteners.
e. Simpson Strong-Tie Co., Inc.
f. Unistrut; Atkore International.

2. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength for anchor and as tested according to ASTM E488/E488M.

B. Provide post-installed concrete anchors that have been prequalified for use in seismic and wind-load applications.

1. Prequalify post-installed anchors in concrete in accordance with ACI 355.2 or other approved qualification testing procedures.
2. Prequalify post-installed anchors in masonry in accordance with approved qualification procedures.

C. Expansion-type anchor bolts are not permitted for equipment in excess of 10 hp that is not vibration isolated.

1. Undercut expansion anchors are permitted.

2.7 CONCRETE INSERTS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Cooper B-line; brand of Eaton, Electrical Sector.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Powers Fasteners.
5. Simpson Strong-Tie Co., Inc.
6. Unistrut; Atkore International.

B. Provide preset concrete inserts that are seismically prequalified in accordance with ICC-ES AC446 testing.

C. Comply with MSS SP-58.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger-Rod Stiffeners: Install where required> to receive them and where required to prevent buckling of hanger rods caused by seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static and seismic loads within specified loading limits.

3.3 INSTALLATION OF SEISMIC-RESTRAINT] DEVICES

A. Provide seismic restraint devices for systems and equipment where indicated in Equipment Schedules or Seismic and Wind-Load Controls Schedule, where indicated on Drawings, where the Specifications indicate they are to be installed on specific equipment and systems, and where required by applicable codes.

1. Install equipment and devices to withstand the effects of earthquake motions

B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

C. Installation of seismic restraints must not cause any stresses, misalignment, or change of position of equipment or conduits.

D. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint] devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Raceway, Cable, Wireway, Cable Tray, and Busway Support and Hanger Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
3. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
4. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

I. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify 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. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors must be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Perform tests and inspections
2. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
3. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
4. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
5. Test no fewer than four of each type and size of installed anchors and fasteners selected by Architect.
6. Test to 90 percent of rated proof load of device.

B. Nonconforming Work:

1. Seismic controls will be considered defective if they do not pass tests and inspections.
2. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

END OF SECTION 260548

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Bands and tubes.
3. Tapes and stencils.
4. Tags.
5. Signs.
6. Cable ties.
7. Miscellaneous identification products.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for electrical identification products.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with 29 CFR 1910.144 for color identification of hazards; 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs and tags; and the following:

1. Fire-protection and fire-alarm] equipment must be finished, painted, or suitably marked safety red.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, must comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

A. Raceways and Cables Carrying Circuits at 1000 V or Less:

1. Black letters on orange field.
2. Legend: Indicate voltage

B. Color-Coding for Phase and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded ~~conducto~~rs.

1. Color must be factory applied Colors for 208Y/120 V Circuits:

a. Phase A: Black.
b. Phase B: Red.
c. Phase C: Blue.

2. Color for Neutral: White.
3. Color for Equipment Grounds Green.

C. Warning Label Colors:

1. Identify system voltage with black letters on orange background.

D. Warning labels and signs must include, but are not limited to, the following legends:

1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

E. Equipment Identification Labels:

1. Black letters on white field.

2.3 LABELS

A. Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Brady Corporation.
b. Champion America.
c. HellermannTyton.
d. Marking Services Inc.
e. Panduit Corp.
f. emedco.

B. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. HellermannTyton.
c. Marking Services Inc.
d. Panduit Corp.
e. Seton Identification Products; a Brady Corporation company.

C. Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. Grafoplast Wire Markers.
c. Ideal Industries, Inc.
d. LEM Products Inc.
e. Marking Services Inc.
f. Panduit Corp.
g. emedco.

2. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over legend. Labels sized such that clear shield overlaps entire printed legend.
3. Marker for Labels:

a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. Grafoplast Wire Markers.
c. HellermannTyton.
d. Ideal Industries, Inc.
e. LEM Products Inc.
f. Marking Services Inc.
g. Panduit Corp.
h. emedco.

2. Minimum Nominal Size:

a. 1-1/2 by 6 inch for raceway and conductors.
b. 3-1/2 by 5 inch for equipment.

c. As required by authorities having jurisdiction.

2.4 BANDS AND TUBES

A. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch long, with diameters sized to suit diameters and that stay in place by gripping action.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. HellermannTyton.
c. Marking Services Inc.
d. Panduit Corp.

B. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at maximum of 200 deg F. Comply with UL 224.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. Panduit Corp.

2.5 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Carlton Industries, LP.
b. Champion America.
c. HellermannTyton.
d. Ideal Industries, Inc.
e. Marking Services Inc.
f. Panduit Corp.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. Carlton Industries, LP.
c. Marking Services Inc.
d. Emedco.

C. Tape and Stencil: 4 inch wide black stripes on 10 inch centers placed diagonally over orange background and are 12 inch wide. Stop stripes at legends.

1. Manufacturers or equal: Subject to compliance with requirements.

a. HellermannTyton.
b. LEM Products Inc.
c. Marking Services Inc.
d. Pipemarker.com; Brimar Industries, Inc.
e. Seton Identification Products; a Brady Corporation company.

D. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

1. Manufacturers or equal: Subject to compliance with requirements.

a. Carlton Industries, LP.
b. Seton Identification Products; a Brady Corporation company.

E. Underground-Line Warning Tape:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Brady Corporation.
b. Ideal Industries, Inc.
c. Marking Services Inc.
d. Pipemarker.com; Brimar Industries, Inc.
e. Seton Identification Products; a Brady Corporation company.

2. Tape:

a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical and communications utility lines.
b. Printing on tape must be permanent and may not be damaged by burial operations.
c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
c. Inscriptions for Orange Tapes: "CAUTION BURIED COMMUNICATION LINE BELOW".

4. Tape Type IDE-601:

a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored,compounded for direct-burial service.
b. Width: 3 inch.
c. Overall Thickness: 5 mil.
d. Foil Core Thickness: 0.35 mil.
e. Weight: 28 lb/1000 sq. ft.
f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi.

F. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch.

2.6 TAGS

A. Write-on Tags:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Carlton Industries, LP.
b. LEM Products Inc.
c. Pipemarker.com; Brimar Industries, Inc.
d. Seton Identification Products; a Brady Corporation company.

2. Polyester Tags: 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment.
3. Marker for Tags:

a. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.7 SIGNS

A. Baked-Enamel Signs:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Carlton Industries, LP.
b. Champion America.
c. Marking Services Inc.
d. Emedco.

2. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
3. 1/4 inch grommets in corners for mounting.
4. Nominal Size: 7 by 10 inch.

B. Metal-Backed Butyrate Signs:

1. Manufacturers or equal: Subject to compliance with requirements.

    a. Brady Corporation.
    b. Champion America.
    c. Marking Services Inc.
    d. Emedco.
2. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396 inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
3. 1/4 inch grommets in corners for mounting.
4. Nominal Size: 10 by 14 inch.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers or equal: Subject to compliance with requirements.

    a. Brady Corporation.
    b. Carlton Industries, LP.
    c. Marking Services Inc.
    d. Seton Identification Products; a Brady Corporation company.
    e. Emedco.
2. Engraved legend.
3. Thickness:

    a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
    b. For signs larger than 20 sq. inch, 1/8 inch thick.
    c. Engraved legend with black letters on white face.
    d. Self-adhesive.
    e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.8 CABLE TIES

A. Manufacturers or equal: Subject to compliance with requirements.

1. HellermannTyton.
2. Ideal Industries, Inc.
3. Marking Services Inc.
4. Panduit Corp.

B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Verify identity of item before installing identification products.

D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

E. Apply identification devices to surfaces that require finish after completing finish work.

F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

G. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

H. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

I. Emergency Operating Instruction Signs: Install instruction signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.

J. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

K. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "TELECOM"
4. ”FIRE ALARM
5. “SECURITY”.
6. “"PUBLIC ADDRESS”

L. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

M. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

N. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

O. Self-Adhesive Labels:

1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.

P. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

Q. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

R. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

S. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

T. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

U. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.

V. Underground Line Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inches below finished grade. Use multiple tapes where width of multiple lines installed in common trenchexceeds 16 inch overall.
2. Install underground-line warning tape for direct-buried cables and cables in raceways.

W. Write-on Tags:

1. Place in location with high visibility and accessibility.
2. Secure using plenum-rated cable ties.

X. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on minimum 1-1/2 inch high sign; where two lines of text are required, use signs minimum 2 inch high.

Y. Metal-Backed Butyrate Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

Z. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

AA. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

C. Accessible Fittings for Raceways and Cables within Buildings: Identify cover of junction and pull box of the following systems with self-adhesive labels containing wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. ".FIRE ALARM"
4. .”SECURITY”
5. “TELECOM”
6. “"PUBLIC ADDRESS”

D. Power-Circuit Conductor Identification, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.

E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with conductor or cable designation, origin, and destination.

F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with conductor designation.

G. Conductors to Be Extended in Future: Attach marker tape to conductors

H. Auxiliary Electrical Systems Conductor Identification: Self-adhesive vinyl tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

I. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

J. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and

29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

K. Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

a. Power-transfer switches.
b. Controls with external control power connections.

M. Arc Flash Warning Labeling: Self-adhesive labels.

N. Operating Instruction Signs: Baked-enamel warning signs.

O. Emergency Operating Instruction Signs: Baked-enamel warning signs with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.

P. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label.
2. Outdoor Equipment: Laminated acrylic or melamine sign.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electronic time switches.
2. Outdoor photoelectric switches, solid state, flexible mounting.
3. Indoor occupancy and vacancy sensors.
4. Switchbox-mounted occupancy sensors.
5. Lighting contactors.
6. Conductors and cables.

B. Related Requirements:
1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Show installation details for the following:

a. Occupancy sensors.
b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace,

including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.

1. Failures include, but are not limited to, the following:
   a. Faulty operation of lighting control devices.

2. Extended Warranty Period: Four year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELECTRONIC TIME SWITCHES

A. Manufacturers or equal: Subject to compliance with requirements.

1. Eaton.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC.
5. Schneider Electric USA, Inc.
6. TE Connectivity Ltd.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 30 A inductive or resistive, 240 V(ac)
4. Programs:
   a. Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
   b. two channels; each channel is individually programmable with two on-off set points on a 24-hour schedule with a skip-a-day weekly schedule.
5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
6. Astronomic Time: All channels.
7. Automatic daylight savings time changeover.
8. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES, SOLID STATE, FLEXIBLE MOUNTING

A. Manufacturers or equal: Subject to compliance with requirements.

1. Eaton.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC.
5. TE Connectivity Ltd.

B. Description: Solid state, with SPST dry contacts rated for 1000 W incandescent or 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
3. Time Delay: Fifteen-second minimum, to prevent false operation.
4. Surge Protection: Metal-oxide varistor.
5. Mounting: Twist lock complies with ANSI C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure from same source and manufacturer as switch.
6. Failure Mode: Luminaire stays ON.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers or equal: Subject to compliance with requirements.

1. Eaton.
2. Hubbell Control Solutions; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
3. Intermatic, Inc.
4. Leviton Manufacturing Co., Inc.
5. Lithonia Lighting; Acuity Brands Lighting, Inc.
6. Lutron Electronics Co., Inc.
7. Philips; Signify North America; Signify Holding.

B. General Requirements for Sensors:

1. Wall Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
2. Passive infrared Dual technology.
3. Separate power pack.
4. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
5. Operation:

    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

6. Sensor Output: Sensor is powered from the power pack.
7. Power: Line voltage.
8. Power Pack: Dry contacts rated for 20 A ballast or LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
9. Mounting:

a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
b. Relay: Externally mounted through a 1/2 inch knockout in a standard electrical enclosure.
c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
11. Bypass Switch: Override the "on" function in case of sensor failure.
12. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch.
2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.
3. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 ft. when mounted on a 10 ft. high ceiling.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2000 sq. ft. when mounted 48 inch above finished floor.

2.4 DIGITAL TIMER LIGHT SWITCH

A. Manufacturers or equal: Subject to compliance with requirements:

1. Eaton.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. NSi Industries LLC.
5. Schneider Electric USA, Inc.

B. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, backlit LCD display, with selectable time interval in 10 minute increments.

1. Rated 960 W at 120 V(ac) for tungsten lighting, 10 A at 120 V(ac) or 10 A at 277 V(ac) for fluorescent or LED lighting, and 1/4 hp at 120 V(ac).
2. Standards: Comply with UL 20.
3. Integral relay for connection to BAS.
4. Voltage: 120 V.
5. Color: White.
6. Faceplate: Color matched to switch.

2.5 LIGHTING CONTACTORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. ABB, Electrification Business.
2. ASCO Power Technologies.
3. Allen-Bradley/Rockwell Automation.
4. Eaton.
5. Leviton Manufacturing Co., Inc.
6. Square D; Schneider Electric USA.

B. Description: Electrically operated and electrically held, combination-type lighting contactors with non-fused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, LED, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION OF SENSORS

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.2 INSTALLATION OF CONTACTORS

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 INSTALLATION OF WIRING

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.

C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Field tests must be witnessed by Architect.

B. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Prepare test and inspection reports.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.

B. Related Requirements:

1.2 DEFINITIONS

A. GFEP: Ground-fault equipment protection.

B. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Power panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Disconnecting and overcurrent protective devices.
4. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
5. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard Schedules: For installation in panelboards.

B. Manufacturers' Published Instructions: Record copy of official installation instructions issued to Installer by manufacturer for the following:

1. Recommended procedures for installing panelboards.
2. Recommended torque settings for bolted connections on panelboards.
3. Recommended temperature range for energizing panelboards.

C. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: one years from date of Substantial Completion; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that panelboards perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

A. Fabricate and test panelboards in accordance with IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing agency recognized by authorities having jurisdiction, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

E. Enclosures: Surface-mounted, dead-front cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: UL 50E, Type 1.
b. Outdoor Locations: UL 50E, Type 3R.
c. Other Wet or Damp Indoor Locations: UL 50E, Type 4.
d. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 5.

2. Height: 7 ft maximum.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
4. .

F. Incoming Mains:

1. Location: Bottom or top as indicated.

G. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. .

H. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type, with lug on neutral bar for each pole in panelboard.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with lug on bar for each pole in panelboard.
4. Sub feed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
5. .

I. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices.

J. Future Devices: Panelboards or load centers must have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

K. Panelboard Short-Circuit Current Rating:
1. Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for 100 percent interrupting capacity.

2.2 POWER PANELBOARDS

A. Manufacturers or equal: Subject to compliance with requirements:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Listing Criteria: NEMA PB 1, distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inch high, provide two latches, keyed alike.

D. Mains: Circuit breaker.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers or equal: Subject to compliance with requirements:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Listing Criteria: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Door-in-door construction with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers or equal: Subject to compliance with requirements:

1. ABB, Electrification Business.

2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:

    a. Inverse time-current element for low-level overloads.
    b. Instantaneous magnetic trip element for short circuits.
    c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:

    a. RMS sensing.
    b. Field-replaceable rating plug or electronic trip.
    c. Digital display of settings, trip targets, and indicated metering displays.
    d. Multi-button keypad to access programmable functions and monitored data.
    e. Ten-event, trip-history log. Each trip event must be recorded with type, phase, and magnitude of fault that caused trip.
    f. Integral test jack for connection to portable test set or laptop computer.
    g. Field-Adjustable Settings:

        1) Instantaneous trip.
        2) Long- and short-time pickup levels.
        3) Long and short time adjustments.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30 mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240 V, single-pole configuration.
8. Sub feed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Breaker handle indicates tripped status.
    c. UL listed for reverse connection without restrictive line or load ratings.
    d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    e. .
    f. Shunt Trip: 120 V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
    g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
    h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NEMA PB 1.1.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
2. Mount top of trim 7.5 ft above finished floor or operating handle of top-most switch or circuit breaker, in on position, is not higher than 79 inches above finished floor unless otherwise indicated.
3. Mount panelboard cabinet plumb and rigid without distortion of box.
4. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
5. Install overcurrent protective devices and controllers not already factory installed.

    a. Set field-adjustable, circuit-breaker trip ranges.

6. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
7. Install filler plates in unused spaces.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Panelboard Nameplates: Label each panelboard with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each branch circuit device in power panelboards with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.

F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.

G. Circuit Directory:

1. Provide directory card inside panelboard door, mounted in metal frame with transparent protective cover.

a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.

3. Create directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Field tests and inspections must be witnessed by Architect

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Nonconforming Work:

1. Panelboards will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports, including certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

F. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade single straight-blade receptacles.
3. General-grade duplex straight-blade receptacles.
4. Receptacles withground-fault protective devices.
5. Locking receptacles.
6. Special-purpose power outlet assemblies.
7. Connectors, cords, and plugs.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for occupancy sensors, timers, control-voltage switches, and control-voltage dimmers.

1.2 PREINSTALLATION MEETINGS

1.3 ACTION SUBMITTALS

A. Product Data:

1. Toggle switches.
2. Maintained-contact switches.
3. Rocker switches.
4. Dimmer switches.
5. Duplex straight-blade receptacles.
6. Receptacles with GFCI device.

B. Shop Drawings:

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES, DIMMER SWITCHES, AND FAN-SPEED CONTROLLER SWITCHES

A. Toggle Switch:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN WMUZ and UL 20.

4. Options:

a. Device Color: As indicated on architectural Drawings.
b. Configuration:
1) General-duty, 120-277 V, 20 A, single pole.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wall plate finish.

B. Rocker Switch:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN WMUZ and UL 20.

4. Options:

a. Device Color: As indicated on architectural Drawings.
b. Configuration:
1) 120-277 V, 20 A, single pole.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wall plate finish.

C. Type I Dimmer Switch:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Leviton Manufacturing Co., Inc.
d. Lutron Electronics Co., Inc.
e. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN EOYX and UL 1472 Type I dimmer.

4. Options:

a. Device Color: As indicated on architectural Drawings.
b. Switch Style: Rocker.
c. Dimming Control Style: Slide.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wall plate finish.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

4. Options:

a. Device Color: As indicated on architectural Drawings.
b. Configuration:
1) General-duty, smooth face, NEMA 5-15R NEMA 5-20R.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wall plate finish.

B. Tamper-Resistant Duplex Straight-Blade Receptacle:

1. Manufacturers or equal: Subject to compliance with requirements.

a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
c. Leviton Manufacturing Co., Inc.
d. Pass & Seymour; Legrand North America, LLC.

2. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

3. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

4. Options:

a. Device Color: As indicated on architectural Drawings.
b. Configuration:
1) General-duty, smooth face,NEMA 5-20R.

5. Accessories:

a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
b. Securing Screws for Cover Plate: Metal with head color matching wall plate finish.

2.3 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

2.4 SELECTION OF GFCI RECEPTACLES

A. provide-feed-through GFCI receptacles.

2.5 INSTALLATION OF SWITCHES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."

a. Mark cover or cover plate using hot, stamped, or engraved machine printing with white-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
b. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

D. Interfaces with Other Work:

2.6 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.

4. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."

a. Mark cover or cover plate using hot, stamped, or engraved machine printing with white-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
b. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

D. Interfaces with Other Work:

1. Do not install Type 3 SPD, including surge-protected relocatable taps and power strips, on branch circuit downstream of GFCI device.

2.7 FIELD QUALITY CONTROL OF SWITCHES

A. Acceptance Testing Preparation:

1. Perform tests per the NETA requirements.Retain first paragraph below to require that field quality-control tests be witnessed. Local ordinance or custom may require that authorities having jurisdiction witness the testing.

B. Field tests and inspections must be witnessed by Architect.

C. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.

D. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Assemble and submit test and inspection reports.

2.8 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Acceptance Testing Preparation:

1. Perform tests per the NETA requirements.

B. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.

C. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

D. Assemble and submit test and inspection reports.

E. Manufacturer Services:

2.9 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

a. Control circuits.
b. Panelboards.
c. Enclosed switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Bussmann; Eaton, Electrical Sector.
2. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 250-V, zero- to 600-A rating, 200 kAIC, time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.2 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non fusible switches.
3. Enclosures.

B. Related Requirements:

1.2 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

B. Shop Drawings: For enclosed switches .

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 WARRANTY

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 FUSIBLE SWITCHES

A. Manufacturers or equal: Subject to compliance with requirements:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty:

1. Single throw.
2. Three pole.
3. 240 V(ac).
4. 200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Manufacturers or equal: Subject to compliance with requirements:

1. ABB, Electrification Business.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 240 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.

2.4 ENCLOSURES

A. Enclosed Switches: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: Enclosure must be finished with gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1).

C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.

PART 3 - Operating Mechanism: EXECUTION

3.1 SELECTION OF ENCLOSURES

A. Indoor, Dry and Clean Locations: UL 50E, Type 1.

B. Outdoor Locations: UL 50E, Type 3R.

C. Wash-Down Areas: UL 50E, Type 4X, stainless steel.

D. Other Wet or Damp, Indoor Locations: UL 50E, Type 4.

E. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.

3.2 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Special Techniques:

1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
2. Install individual wall-mounted switches with tops at uniform height unless otherwise indicated.
3. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
4. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
5. Install fuses in fusible devices.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Preparation:

B. Field tests and inspections must be witnessed by Architect.

C. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the following methods:

1) Use low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
b. Measure contact resistance across each switchblade fuse holder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.

D. Nonconforming Work:

1. Enclosed switches will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

F. Manufacturer Services:

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes lightning protection system for the following:

1. Ordinary structures.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include layouts of the lightning protection system, with details of the components to be used in the installation.
2. Include raceway locations needed for the installation of conductors.
3. Details of air terminals, ground rods, ground rings, conductor supports, splices, and terminations, including concealment requirements.
4. Calculations required by NFPA 780 for bonding of metal bodies.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Lightning protection system Shop Drawings, drawn to scale, coordinated with each other, using input from installers of the items involved:

B. Qualification Data: For Installer.

C. Product certificates.

D. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Completion Certificate:

1. UL Master Label Certificate.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: UL-listed installer, category OWAY.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers or equal: Subject to compliance with requirements:

1. ERICO; brand of nVent Electrical plc.
2. Harger Lightning & Grounding; business of Harger, Inc.
3. National Lightning Protection.
4. Robbins Lightning, Inc.
5. Thompson Lightning Protection, Inc.
6. VFC Lightning Protection.

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Lightning Protection Standard: Comply with NFPA 780 requirements for Class I buildings.

B. Lightning Protection Components, Devices, and Accessories: Listed and labeled by a qualified testing agency as complying with UL 96, and marked for intended location and application.

2.3 MATERIALS

A. Air Terminals:

1. Aluminum unless otherwise indicated.
2. 3/8-inch diameter by 24 inches> long.
3. Rounded tip.
4. Integral base support.

B. Class 1 Main Conductors:

C. Stranded Copper: 57,400 circular mils in diameter.

D. Aluminum: 98,600 circular mils in diameter.

E. Secondary Conductors:
1. Aluminum: 41,400 circular mils in diameter.

F. Ground Loop Conductor: Tinned copper**.**

G. Ground Rods:

1. Material Copper-clad steel.
2. Diameter: 5/8 inch.
3. Rods shall be not less than 120 inches long.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lightning protection components and systems according to UL 96A

B. Install conductors with direct paths from air terminals to ground connections. Avoid bends less than 90 degrees and 8 inches in radius and narrow loops.

C. Conceal conductors within normal view from exterior locations at grade within 200 feet of building. Comply with requirements for concealed installations in UL 96A

D. Ground Ring Electrode: The conductor shall be not less than the main-size lightning conductor.

3.2 CONNECTIONS

A. Aboveground concealed connections, and connections in earth or concrete, shall be done by exothermic welds or by high-compression fittings listed for the purpose.

B. Aboveground exposed connections shall be done using the following types of connectors, listed and labeled for the purpose: crimp.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

3.3 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:

1. Perform inspections as required to obtain a UL Master Label for system.

B. Prepare test and inspection reports and certificates.

END OF SECTION 264113

Alternate Lightning Protection System
CMCE Lightning Suppression System (CMCE) Non-conventional Lightning Prevention or equal

GENERAL SPECIFICATIONS FOR RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL LIGHTNING PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, components, equipment, and services to perform all operations required for the complete installation and related work as specified herein.

B. Any such work in any other section of these specifications that is not specifically described therein shall comply with the requirements of this section.

C. The following items of work are specifically included in, but not necessarily limited to, the work of this section without limiting the generality implied by these specifications:
1. CMCE lightning protection air terminal
2. Mast, complete with base and supports
3. Down conductors
4. Grounds
5. Transient Voltage Surge Suppression (if selected)

1.2 DEFINITIONS

A. Manufacturer – The term manufacturer shall refer to the EMP Solutions, Inc. or equal: Subject to compliance with requirements.

B. CMCE – CMCE shall refer to any model of the CMCE lightning suppresser or equal.

1.3 SUBMITTALS

A. Provide shop drawings for review, showing location of CMCE air terminal, mast, conductors, grounding system, installation procedures and details.

B. Detailed manufacturer’s data sheets on all components, accessories and miscellaneous equipment shall also be submitted.

1.4 DESCRIPTION OF SYSTEM

A. Provide a complete installation of equipment to comprise a complete system in accordance with CMCE Manufacturer’s installation Standard.

B. The installing contractor shall be responsible for all components and labor to accomplish this result.

C. The system shall be installed so that completed work is unobtrusive and does not detract from the building appearance.

1.5 CODES, REGULATIONS, PERMITS

A. The completed system shall comply with CMCE Manufacturer's Installation Standard, equipment supplier drawings and specification requirements for installation of CMCE lightning protection systems.

B. The installing contractor shall accomplish any corrections required by the inspection at his own expense.

C. Noncompliance shall be reported to the equipment supplier for remedy.

1.6 STANDARDS OF QUALITY

A. The CMCE system equipment supplier, contractor, and installer shall install the CMCE system in compliance with the Manufacturer's Installation Standard.

B. Manufacturer's guarantee and warranty shall be submitted to the owner upon completion of the installation.

C. Manufacturer's Warranty of 10 Years applies to all models sold through EMP Solutions or one of their authorized dealers.

D. Manufacturer's "No Strike" Guarantee applies to all devices sold and installed by an approved installer. This guarantee ranges from $50,000 USD to $500,000 USD and is subject to terms and conditions.

1.7 SERVICE AND INSPECTION

A. The installation of the equipment shall be reviewed by the manufacturer and shall be in accordance with the manufacturer's requirements.

B. The installation shall be inspected by an agent of the manufacturer for compliance with Manufacturer's Installation Standard.

C. The lightning Protection Installing Contractor shall provide photos of the installation, including but not limited to; mast mounting, bonding connections (waterline & structural steel), down conductors, ground rods/grids and all buried, concealed, or inaccessible connections and components.
   1. This information shall be forwarded to the CMCE Manufacturer for evaluation, certification, archiving, and documentation.
   2. The ground resistance of the completed system shall be measured using an approved clamp meter, ideally AEMC 6417 or similar. Ground resistance shall not exceed 10 ohms.

1.8 CONDUCTORS

A. Copper down conductors shall be 19-32 strands of 14-guage wire rope lay, with a net weight of 200-375 pounds per 1,000 feet minimum length.

B. The structural steel may be utilized as the main conductor provided the steel is electrically continuous or is made so via other means and with approval from the Manufacturer.

C. All conductors shall be secured every 3'-0" (900mm) maximum.

D. Fasteners and clips utilized shall be of equal corrosion resistance as the components being secured.

E. Bare copper components shall not be installed on dissimilar metals. Corrosion resistant copper equipment shall be utilized where these conditions exist.

F. Corrosion resistant copper conductors and fittings shall be utilized where corrosive atmospheres are present.

G. Conductors shall be installed so that a conductor shall always have a horizontal or downward path, free of "U" and "V" pockets, with the exception that an 8" (203mm) maximum rise, or a rise of 3" (80mm) maximum for every 12" (300mm) of conductor length shall be permitted in a main conductor run.

H. Each CMCE terminal shall have one (1) down conductors from the base of the mast to the grounding system.

I. The electrical contractor shall furnish and install all necessary PVC conduit for concealed down conductors.

J. No bend of a conductor shall be less than 90 degrees and shall not have a radius of bend of less than 8" (203mm). Exceptions are through roof and wall assemblies and "T" connections.

1.9 MAST

A. Aluminum, galvanized, carbon or stainless-steel mast are acceptable.

B. Mast support, depending upon application, may be roof mounting base, side mounting, or structural support.

1.10 GROUNDING SYSTEM

A. Ground rods shall be copper bound ½" x 10'-0", minimum.

B. Ground rods shall be installed, as needed, to achieve the 10 ohm or less ground resistance.

C. Ground plates of high conductivity copper sheet, 20 gauge minimum, 24 in. sq., may be used in lieu of ground rods if soil conditions make it impossible to drive ground rods. Chemical rods may also be used in lieu of plates or rods.

D. The cable attachments to the ground rods must be accomplished via an exothermic weld or mechanical clamp. A ground loop may be substituted for the ground rods or ground plates. The ground loop must be of a main size conductor and shall comply with the ten (10) ohm resistance requirement of the grounding system.

E. Ground rods, ground plates, and ground loop conductors shall be installed a minimum of 1ft. (300mm) below grade and a minimum of 2ft. (600mm) away from the foundation. Bonding of grounded systems shall be via main size conductors. The bonding shall be accomplished to achieve equal potential of all grounds.

1.11 CONNECTORS, FITTINGS, FASTENERS, AND HARDWARE

A. Provide all connectors, fittings, fasteners, hardware, clamps, guards, lugs, etc., as required to connect, and install all parts of the system.

B. All equipment shall be fabricated from copper and/or bronze components.

1.12 SURGE SUPPRESSION (recommended but optional)

A. Provide surge protection on the electrical, telephone, and antenna and TV lead wires.

B. The surge suppresser for the main electrical panel shall be industrial grade, with replaceable modules, fused, indicator lights.

C. The electrical surge suppression equipment shall be installed at the main entrance of the electrical system with a disconnecting mechanism.

D. The surge suppresser shall have the capability of being disconnected without shutting down the electrical system.

E. Telephone surge suppression shall be to the standards of the telephone system carrier.

F. The suppresser shall be industrial grade with replaceable modules, and a reaction time of less than one (1) nanosecond.

G. This surge equipment shall be installed at the main entrance of the telephone system.

H. Antenna and TV lead wire suppressers shall be industrial grade suitable for the conductor, coax or hard wire. The suppresser shall have a reaction time of less than one (1) nanosecond and shall be installed as close to the antenna or TV camera as possible.

1.13 INSTALLATION

A. Installation shall be accomplished in a professional manner by a lightning protection installing contractor or a licensed electrical contractor.

B. All work installed within the building shall be concealed.

C. All work installed in accessible locations shall be properly guarded and protected.

D. All components shall be installed in a manner to prevent electrolytic action under presence of moisture.

E. All roof, wall, or other building penetrations shall be made in a manner to prevent the ingress of water or moisture.

F. Roof penetrations, flashings/pitch pans shall be furnished and installed by the contractor.

SECTION 264313 - SURGE PROTECTIVE DEVICES FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Type 1 surge protective devices.
2. Type 2 surge protective devices.
3. Enclosures.

B. Related Requirements:
1. Section 262416 "Panelboards" for integral SPDs installed by panelboard manufacturer.

1.2 DEFINITIONS

A. I_n: Nominal discharge current.

B. Voltage Protection Rating (VPR): A rating selected from UL 1449 list of preferred values assigned to each mode of protection.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

a. Include electrical characteristics, specialties, and accessories for SPDs.
b. Certification of compliance with UL 1449 by qualified electrical testing laboratory recognized by authorities having jurisdiction including the following information:

1) Tested values for VPRs.
2) I_n ratings.
3) MCOV, type designations.
4) OCPD requirements.
5) Manufacturer's model number.
6) System voltage.
7) Modes of protection.

B. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.5 WARRANTY

A. Special Manufacturer Extended Warranty: Manufacturer warrants that SPDs perform in accordance with specified requirements and agrees to provide repair or replacement of SPDs that fail to perform as specified within extended warranty period.

1. Initial Extended Warranty Period: Five year(s) from date of Substantial Completion, for labor, materials, and equipment.
2. Follow-On Extended Warranty Period: 10 year(s) from date of Substantial Completion, for materials only, f.o.b. the nearest shipping point to Project site.

PART 2 - PRODUCTS

2.1 TYPE 1 SURGE PROTECTIVE DEVICES (SPDs)

A. Manufacturers or equal: Subject to compliance with requirements.

1. ABB, Electrification Business.
2. Advanced Protection Technologies Inc. (APT).
3. DITEK Surge Protection.
4. Eaton.
5. Schneider Electric USA, Inc.
6. Siemens Industry, Inc., Energy Management Division.

B. Source Limitations: Obtain devices from single source from single manufacturer.

C. General Characteristics:

1. Reference Standards: UL 1449, Type 1.
2. MCOV: Not less than 125 percent of nominal system voltage for 208Y/120 V and 120/240 V power systems, and not less than 115 percent of nominal system voltage for 480Y/277 V power systems.
3. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating per phase must not be less than 160 kA. Peak surge current rating must be arithmetic sum of the ratings of individual MOVs in a given mode.
4. Protection modes and UL 1449 VPR for grounded wye circuits with 208Y/120 V, three-phase, four-wire circuits must not exceed the following:

   a. Line to Neutral: 700 V for 208Y/120 V.
   b. Line to Line: 1200 V for 208Y/120 V.

5. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits must not exceed the following:

   a. Line to Neutral: 700 V.
   b. Line to Line: 1200 V.

6. SCCR: Not less than 100 kA.

7. I_n Rating: 20 kA.

D. Options:

1. Include integral disconnect switch.
2. Include internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include indicator light display for protection status.
4. Include audible alarm.
5. Include surge counter.

2.2 ENCLOSURES

A. Indoor Enclosures: Type 1.

B. Outdoor Enclosures: Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide OCPD and disconnect for installation of SPD in accordance with UL 1449 and manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. Compare equipment nameplate data for compliance with Drawings and the Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's installation requirements.

C. Nonconforming Work:

1. SPDs that do not pass tests and inspections will be considered defective.
2. Remove and replace defective units and retest.

D. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks in accordance with manufacturer's instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests; reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

END OF SECTION 264313

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of LED luminaires:
   1. Downlight.
   2. Linear industrial.
   3. Recessed, linear.
   4. Strip light.
   5. Surface mount, linear.
   6. Suspended, linear.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

C. Product Certificates: For each type of luminaire.

D. Product test reports.

E. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

B. Provide luminaires from a single manufacturer for each luminaire type.

C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.6 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

B. Ambient Temperature: 41 to 104 deg F].

1. Relative Humidity: Zero to 95 percent.

C. Altitude: Sea level to 1000 feet.

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.
b. Lamp diameter, shape, size, wattage, and coating.
c. CCT and CRI.

C. Recessed luminaires shall comply with NEMA LE 4.

2.3 DOWNLIGHT.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Architectural Lighting Works.
2. Cooper Lighting Solutions; Signify North America Corp.
3. Edge Lighting.
4. Edison Price Lighting.
5. Elite Lighting Corporation.

B. Nominal Operating Voltage: 120 V ac

C. Lamp:

1. Minimum 1000 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of [minimum] 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear anodized finish.
3. Universal mounting bracket.
4. Integral junction box with conduit fittings.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Fixed lens.
2. Medium light distribution.
3. Clear glass.
4. Glass: Annealed crystal glass unless otherwise indicated.
5. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.

2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. Recessed luminaires shall comply with NEMA LE 4.

2.4 LINEAR INDUSTRIAL.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Cooper Lighting Solutions; Signify North America Corp.
2. Lighting Science Group.
3. Lithonia Lighting; Acuity Brands Lighting, Inc.
4. OSRAM SYLVANIA.
5. RAB Lighting.

B. Lamp:

1. Minimum 5,000 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. User-Replaceable Lamps:

   a. Bulb shape complying with ANSI C78.79.
   b. Lamp base complying with ANSI C81.61].

6. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

C. Housings:

1. Extruded-aluminum housing and heat sink.
2. painted finish.

D. Housing and Heat Sink Rating:
1. IP 66.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic glass.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. With integral mounting provisions.

H. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.

2.5 LOWBAY.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Cooper Lighting Solutions; Signify North America Corp.
2. GE Current, a Daintree company; American Industrial Partners (AIP).
3. Lighting Science Group.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 10,000 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Internal driver.
6. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.

7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Clear glass.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.6 RECESSED, LINEAR.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Architectural Lighting Works.
2. Cooper Lighting Solutions; Signify North America Corp.
3. Elite Lighting Corporation.
4. GE Current, a Daintree company; American Industrial Partners (AIP).
5. Lithonia Lighting; Acuity Brands Lighting, Inc.

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 3,000 lm.
2. Minimum allowable efficacy of 85 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61

8. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic glass.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.
4. NEMA LE 4.

2.7 STRIP LIGHT.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Cooper Lighting Solutions; Signify North America Corp.
2. GE Current, a Daintree company; American Industrial Partners (AIP).
3. Lighting Science Group.
4. Lithonia Lighting; Acuity Brands Lighting, Inc.
5. OSRAM SYLVANIA.
6. Philips; Signify North America; Signify Holding.

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 750 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Internal driver.
6. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61].

7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping of luminaire without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic acrylic.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Glass: Annealed crystal glass unless otherwise indicated.
4. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.

3. UL Listing: Listed for damp location.

2.8 SURFACE MOUNT, LINEAR.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Architectural Lighting Works.
2. Axis Lighting, Inc.
3. Cooper Lighting Solutions; Signify North America Corp.
4. Elite Lighting Corporation.
5. Lighting Science Group.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.
7. OSRAM SYLVANIA.

B. Nominal Operating Voltage: 120 V ac].

C. Lamp:

1. Minimum 750 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Internal driver.
6. User-Replaceable Lamps:

   a. Bulb shape complying with ANSI C78.79.
   b. Lamp base complying with ANSI C81.61

7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic acrylic.
2. Acrylic Diffusers: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.9 SURFACE MOUNT, NONLINEAR

A. Manufacturers or equal: Subject to compliance with requirements:

1. Architectural Lighting Works.
2. Cooper Lighting Solutions; Signify North America Corp.
3. Edge Lighting.
4. Elite Lighting Corporation.
5. Lithonia Lighting; Acuity Brands Lighting, Inc.

B. Nominal Operating Voltage: 120 V ac

C. Lamp:

1. Minimum 750 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Internal driver.
6. User-Replaceable Lamps:

    a. Bulb shape complying with ANSI C78.79.
    b. Lamp base complying with ANSI C81.61.

7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Clear glass.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.

2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.10 SUSPENDED, LINEAR.

A. Manufacturers or equal: Subject to compliance with requirements:

1. Architectural Lighting Works.
2. Axis Lighting, Inc.
3. Cooper Lighting Solutions; Signify North America Corp.
4. Edge Lighting.
5. Elite Lighting Corporation.
6. Lithonia Lighting; Acuity Brands Lighting, Inc.

B. Nominal Operating Voltage: 120 V ac.

C. Lamp:

1. Minimum 3,000 lm.
2. Minimum allowable efficacy of 85 lm/W.
3. CRI of minimum 80. CCT of 4100 K.
4. Rated lamp life of 50,000 hours to L70.
5. Internal driver.
6. User-Replaceable Lamps:

a. Bulb shape complying with ANSI C78.79.
b. Lamp base complying with ANSI C81.61.

7. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

D. Housings:

1. Extruded-aluminum housing and heat sink.
2. Clear powder-coat finish.
3. With integral mounting provisions.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:

1. Prismatic glass.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125-inch minimum unless otherwise indicated.

G. Standards:

1. ENERGY STAR certified.

2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.11 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Steel:

1. ASTM A36/A36M for carbon structural steel.
2. ASTM A568/A568M for sheet steel.

C. Stainless Steel:

1. 1. Manufacturer's standard grade.
2. 2. Manufacturer's standard type, ASTM A240/240M.

D. Galvanized Steel: ASTM A653/A653M.

E. Aluminum: ASTM B209.

2.12 METAL FINISHES

A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.13 LUMINAIRE SUPPORT

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage.

D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install lamps in each luminaire.

D. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Provide support for luminaire without causing deflection of ceiling or wall.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 265119

SECTION 265213 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Emergency lighting.
2. Exit signs.
3. Materials.
4. Luminaire support components.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of emergency lighting unit, exit sign, and emergency lighting support.

a. Include data on features, accessories, and finishes.
b. Include physical description of unit and dimensions.
c. Battery and charger for light units.
d. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
e. Include photometric data and adjustment factors based on laboratory tests by, or under supervision of, qualified luminaire photometric testing laboratory, for each luminaire type.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of luminaire.

B. Sample Warranty: For manufacturer's warranty.

1.4 WARRANTY

A. Special Manufacturer Extended Warranty for Batteries for Emergency and Exit Lighting: Manufacturer warrants that batteries for emergency luminaires and exit signs perform in accordance with specified requirements and agrees to provide repair or replacement of batteries that fail to perform as specified within extended warranty period.

1. Extended Warranty Period: Five year(s) from date of Substantial Completion; prorated coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70 and UL 924, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Comply with NFPA 101.

C. Comply with NEMA LE 4 for recessed luminaires.

D. Lamp Base: Comply with ANSI C81.61.

E. Bulb Shape: Complying with ANSI C79.1.

F. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with LED driver.

1. Emergency Connection: Operate LED lamp(s) continuously at an output of 1400 lumens each upon loss of normal power. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire LED driver.
2. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
3. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

4. Battery: Sealed, maintenance-free, nickel-cadmium type.
5. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
6. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

A. General Characteristics: Self-contained units.

B. Emergency Luminaire:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Architectural Lighting Works.
b. Cooper Lighting Solutions; Signify North America Corp.
c. Dual-Lite; brand of Hubbell Electrical Solutions; Hubbell
d. Incorporated.Lithonia Lighting; Acuity Brands Lighting, Inc.
e. Philips; Signify North America; Signify Holding.

2. Options:

a. Operating at nominal voltage of 120 V(ac).
b. Internal emergency power unit.
c. Rated for installation in damp locations, and for sealed and gasketed luminaires in wet locations.
d. UL 94 5VA flame rating.

2.3 EXIT SIGNS

A. General Characteristics: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Sign:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Cooper Lighting Solutions; Signify North America Corp.
b. Hubbell Lighting; brand of Hubbell Electrical Solutions;
c. Hubbell Incorporated.Lithonia Lighting; Acuity Brands Lighting, Inc.
d. Philips; Signify North America; Signify Holding.

2. Options:

a. Operating at nominal voltage of 120 V(ac).
b. Lamps for AC Operation:
1) LEDs; 50,000 hours minimum rated lamp life.

2.4 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components must be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

C. Diffusers and Globes:

1. Clear, UV-stabilized acrylic.
2. Acrylic: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Housings:

1. Extruded aluminum housing.
2. Clear powder coat finish.

E. Conduit: EMT, minimum metric designator 21 (trade size 3/4).

2.5 METAL FINISHES

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

B. Install lamps in each luminaire.

C. Supports:

1. Sized and rated for luminaire and emergency power unit] weight.
2. Able to maintain luminaire position when testing emergency power unit.
3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
4. Luminaire-mounting devices must be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.

D. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls>.
2. Do not attach luminaires directly to gypsum board.

E. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inch, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

F. Ceiling Grid Mounted Luminaires:

1. Secure to outlet box, if provided.
2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.

3.2 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

C. Nonconforming Work:

1. Luminaire will be considered defective if it does not pass operation tests and inspections.
2. Remove and replace defective units and retest.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:

1. Inspect luminaires. Replace lamps,, batteries, exit signs, and luminaires that are defective.

a. Parts and supplies must be manufacturer's authorized replacement parts and supplies.

2. Conduct short-duration tests on all emergency lighting.

3.5 PROTECTION

A. Remove and replace luminaires and exit signs that are damaged or caused to be unfit for use by construction activities.

END OF SECTION 265213

SECTION 265613 - LIGHTING POLES AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Poles and accessories for support of luminaires.

1.2 DEFINITIONS

A. EPA: Equivalent projected area.

B. Luminaire: Complete luminaire.

C. Pole: Luminaire-supporting structure, including tower used for large-area illumination.

D. Standard: See "Pole."

1.3 ACTION SUBMITTALS

A. Product Data: For each pole, accessory, and luminaire-supporting and -lowering device.

B. Shop Drawings:

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Detail fabrication and assembly of poles and pole accessories.
4. Foundation construction details, including material descriptions, dimensions, anchor bolts, support devices, and calculations, signed and sealed by a professional engineer licensed in the state of installation.
5. Anchor bolt templates keyed to specific poles and certified by manufacturer.
6. Method and procedure of pole installation. Include manufacturer's written installations.

1.4 INFORMATIONAL SUBMITTALS

A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by luminaire and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.

B. Material test reports.

C. Field quality-control reports.

D. Sample warranty.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Foundation and pole shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Component Importance Factor: 1.0.

B. Structural Characteristics: Comply with AASHTO LTS-6-M.

C. Dead Load: Weight of luminaire and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.

D. Live Load: Single load of 500 lbf distributed according to AASHTO LTS-6-M.

E. Ice Load: Load of 3 lbf/sq. ft., applied according to AASHTO LTS-6-M for applicable areas on the Ice Load Map.

F. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.

1. Basic wind speed for calculating wind load for poles 50 feet high or less is160 mph.

a. Wind Importance Factor: 1.0.
b. Minimum Design Life: 25 years.
c. Velocity Conversion Factor: 1.0.

G. Strength Analysis: For each pole, multiply the actual EPA of luminaires and brackets by a factor of 1.1 to obtain the EPA to be used in pole selection strength analysis.

H. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

2.2 STEEL POLES

A. Manufacturers or equal: Subject to compliance with requirements.

1. American LitePole.
2. Cooper Lighting Solutions; Signify North America Corp.
3. H.E. Williams.
4. Hapco.
5. Hubbell Electrical Solutions; Hubbell Incorporated.
6. Kim Lighting; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
7. Lithonia Lighting; Acuity Brands Lighting, Inc.

B. Source Limitations: Obtain poles from single manufacturer or producer.

C. Poles: Comply with ASTM A500/A500M, Grade B carbon steel with a minimum yield of 46,000 psig; one-piece construction up to 40 feet in height with access handhole in pole wall.

1. Shape: round, straight].
2. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.

E. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication unless otherwise indicated.

F. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Section 260526 "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size indicated, and accessible through handhole.

G. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

H. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported load multiplied by a 5.0 safety factor.

I. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces according to SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, according to SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Interior Surfaces of Pole: One coat of bituminous paint, or otherwise treat for equal corrosion protection.
3. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high gloss, high-build polyurethane enamel.

    a. Color: As indicated by manufacturer's designations.

2.3 POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, finished same as pole, and arranged to cover pole's mounting bolts and nuts.

2.4 MOUNTING HARDWARE

A. Anchor Bolts: Manufactured to ASTM F1554, Grade 55, with a minimum yield strength of 55,000 psi.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Threading: Uniform National Coarse, Class 2A.

B. Nuts: ASTM A563, Grade A, Heavy-Hex.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Two nuts provided per anchor bolt.

C. Washers: ASTM F436, Type 1.

1. Galvanizing: Hot dip galvanized according to ASTM A153, Class C.
2. Two washer(s) provided per anchor bolt.

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 unacceptable. 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 POLE FOUNDATION

A. Direct-Buried Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than as indicated. To ensure a plumb installation, continuously check pole orientation with plumb bob while tamping.

1. Make holes 6 inches in diameter larger than pole diameter.
2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of3500 psi at 28 days and finish in a dome above finished grade.
3. Use a short piece of 1/2-inch diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
4. Cure concrete a minimum of 72 hours before performing work on pole.

B. Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

3.2 POLE INSTALLATION

A. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Foundation-Mounted Poles: Mount pole with leveling nuts and tighten top nuts to torque level according to pole manufacturer's written instructions.

C. Poles and Pole Foundations Set in Concrete-Paved Areas: Install poles with a minimum 6-inch-wide, unpaved gap between the pole or pole foundation and the edge of the adjacent concrete slab. Fill unpaved ring with pea gravel. Insert material to a level 1 inch below top of concrete slab.

D. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum using insulating fittings or treatment.

B. Steel Conduits: Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50-percent overlap.

3.4 GROUNDING

A. Ground Metal Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole unless otherwise indicated.
2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Ground metallic components of pole accessories and foundation.

END OF SECTION 265613

SECTION 265619 - LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 265613 "Lighting Poles and Standards" for poles and standards used to support exterior lighting equipment.

1.2 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of luminaire.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale and coordinated.

B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

C. Product Certificates: For each type of the following:

1. Luminaire.
2. Photoelectric relay.

D. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Provide a list of all lamp types used on Project. Use ANSI and manufacturers' codes.
2. Provide a list of all photoelectric relay types used on Project; use manufacturers' codes.

1.6 FIELD CONDITIONS

A. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.7 WARRANTY

A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Seismic Performance: Luminaires and lamps shall be labeled vibration and shock resistant.

1. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 LUMINAIRE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. NRTL Compliance: Luminaires shall be listed and labeled for indicated class and division of hazard by an NRTL.

C. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

D. UL Compliance: Comply with UL 1598 and listed for wet location.

E. Lamp base complying with ANSI C81.61.

F. CRI of minimum 80. CCT of 4000 K.

G. L70 lamp life of 50,000 hours.

H. Nominal Operating Voltage: 208 V ac.

I. In-line Fusing: Separate in-line fuse for each luminaire.

J. Lamp Rating: Lamp marked for outdoor use.

K. Source Limitations:

1. Obtain luminaires from single source from a single manufacturer.

2.3 LUMINAIRE TYPES

A. Area and Site:
1. Luminaire Shape: Round
2. Mounting: Pole with round arm,in length.
3. Luminaire-Mounting Height: 30 feet.
4. Distribution: Type IV.

2.4 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Sheet Metal Components: Corrosion-resistant aluminum. Form and support to prevent warping and sagging.

C. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

D. Diffusers and Globes:
1. Glass: Annealed crystal glass unless otherwise indicated.
2. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

E. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

F. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

G. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

2.5 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. 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.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.

2.6 LUMINAIRE SUPPORT COMPONENTS

A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Comply with NECA 1.

B. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Install lamps in each luminaire.

D. Fasten luminaire to structural support.

E. Supports:

1. Sized and rated for luminaire weight.
2. Able to maintain luminaire position after cleaning and relamping.
3. Support luminaires without causing deflection of finished surface.
4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

F. Wall-Mounted Luminaire Support:

1. Attached to a minimum 1/8 inch backing plate attached to wall structural members.

G. Wiring Method: Install cables in raceways. Conceal raceways and cables.

H. Install luminaires at height and aiming angle as indicated on Drawings.

I. Coordinate layout and installation of luminaires with other construction.

J. Adjust luminaires that require field adjustment or aiming.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" and Section 260533 "Raceways and Boxes for Electrical Systems" for wiring connections and wiring methods.

3.2 INSTALLATION OF INDIVIDUAL GROUND-MOUNTED LUMINAIRES

A. Aim as indicated on Drawings.

B. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 033000 "Cast-in-Place Concrete."

3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

a. IES LM-5.
b. IES LM-50.
c. IES LM-52.
d. IES LM-64.
e. IES LM-72.

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain luminaires.

END OF SECTION 265619

SECTION 270000 - COMMUNICATIONS STRUCTURED CABLING SYSTEM

PART 1 – GENERAL

1.1 CONTRACTOR QUALIFICATIONS

The Structured Cabling System Contractor shall be an experienced firm regularly engaged in the layout and installation of structured cabling systems of similar size and complexity as required for this installation. The Structured Cabling System Contractor, under the same company name, shall have successfully completed the layout, installation, testing and warranty of not less than five Structured Cabling Systems of the scope of the largest system on this project for a minimum period of three years prior to the bid date, and shall have been regularly engaged in the business of Structured Cabling Systems contracting continuously since. The Structured Cabling System Contractor shall have an existing permanent office located within 75 miles of the job site from which installation and warranty service operations will be performed.

The Structured Cabling System Contractor shall have a BICSI Registered Communications Distribution Designer (RCDD) on staff who is a permanent employee of the company. The RCDD shall be in responsible charge of the project from start to finish.

The Structured Cabling System Contractor shall be in good standing with the Structured Cabling System Manufacturer as a Belden Certified Installer or equal. The Structured Cabling System Contractor shall complete the Structured Cabling System Manufacturer’s Certified Installer training program. The Structured Cabling System Manufacturer shall require permanent employees of the Structured Cabling System Contractor complete the full certification program. Each Certified Installer shall attend re-certification classes every two years. The Structured Cabling System certified employees shall include not less than one designer and one installation supervisor.

A. Contractor Qualifications – Conduit Installation:

All conduit and related work shall be provided by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents.

B. Definitions
CM - Construction Manager
DB - Design Build
Contractor GC - General
Contractor

Where the three terms CM, DB, and GC are used in the specifications and TEL drawings they are used interchangeably. The Contractor shall understand the terms to mean the construction entity in overall charge of the project, whether a CM, DB or GC.

1.2 PROOF OF CONTRACTOR QUALIFICATIONS

The Structured Cabling System Contractor shall provide the following documentation, to the GC and to the Owner within three working days of a request, as evidence that the requirements for Structured Cabling System Contractor qualifications listed above are satisfied. The Structured

Cabling System Contractor shall meet the requirements of this specification section for structured cabling system work. All work under this section shall be performed by permanent employees of the Structured Cabling System Contractor listed on the bid form, and shall not be performed by another subcontractor, employees of another company, or by temporary employees. The only exceptions to these requirements shall be for conduit work, which may be performed by an electrical contractor meeting the minimum requirements of paragraph 1.1.A. Under no circumstances shall temporary employees be used for any work for these systems.

A. Provide a list of not less than five (5) references for jobs of similar size and complexity including project name, location, contact person and phone number.

B. Provide RCDD name, BICSI certification number, and qualifications.

C. Provide location of existing permanent office from which installation and warranty work will be performed.

D. Provide copies of certificates issued by Structured Cabling System Manufacturer proving that the Structured Cabling System Contractor is in good standing with the manufacturer as a Certified Installer, and that the Structured Cabling System Contractor can offer the Owner a 25 year system warranty in partnership with the Structured Cabling System Manufacturer.

1.3 RELATED REQUIREMENTS

Drawings and general provisions of Contract apply to this section.

Electrical Specification Sections regarding conduit and raceway apply to work under this section, with the additions and modifications specified herein and on the TEL drawings. The special requirements indicated on the TEL drawings and in this specification section for structured cabling system conduit and all cable pathways shall take precedence over any requirements specified in Electrical Specification Sections.

See Specification Section 27 80 00 for IP Security Camera System cabling work by the Structured Cabling System Contractor.

1.4 DESCRIPTION OF WORK

The work consists of all labor, materials, equipment and services necessary to provide, install, test and certify all systems as described in the contract documents. The Structured Cabling System Contractor shall provide systems complete and ready for operation. The installation shall include all accessories and appurtenances required to provide a complete and operational system. Any materials not specifically mentioned in these specifications or not shown on the drawings but required for a complete and finished installation shall be furnished and installed at no additional cost to the Owner.

A. Special Warranty – Structured Cabling System:

The Structured Cabling System Contractor and The Structured Cabling System Manufacturer shall provide a 25 year warranty for the completed Structured Cabling System. The 25 year warranty shall commence on the date of Final Completion and Final Acceptance by the Owner/Architect.

The installed system shall be manufacturer certified and shall meet or exceed all performance

criteria established by TIA/EIA Category 6 and Category 6A standards for unshielded UTP cabling. The electrical performance of all UTP cabling shall be characterized to 250 MHz for Category 6 cable and to 500 MHz for Category 6A cable and shall be proven by field testing of the Permanent Link.

The 25 year warranty shall cover the Structured Cabling System end-to-end and shall include parts and labor costs for replacement of defective parts or installation. The warranty shall also cover current applications plus all future applications approved to run on Category 6 and Category 6A cabling systems. The performance parameters guaranteed by The Structured Cabling System Manufacturer in published literature shall be based on worst case testing of a channel configuration using a 100 meter model constructed using four connection points consisting of a horizontal cross-connect, a consolidation point and a work area outlet.

The Structured Cabling System Contractor shall test all Category 6 and Category 6A cabling for the Permanent Link in strict accordance with TIA standards. The test results shall indicate that each cable achieved a PASS rating without exception.

The Structured Cabling System Contractor shall provide all necessary documentation to the Structured Cabling System Manufacturer required to properly register the system with the manufacturer for warranty purposes.

B. Scheduling:

The Structured Cabling System Contractor shall become thoroughly familiar with the overall project schedule and shall complete his work and make all systems fully operational prior to the date of occupancy of the facilities by the Owner.

The Structured Cabling System Contractor shall coordinate all work with the General Contractor and the Electrical Contractor, as well as all other trades.

The Structured Cabling System Contractor shall be responsible for coordinating all work related to cable pathways indicated on the TEL sheets, even if that work is being performed by the project electrical contractor. The Structured Cabling System Contractor shall inform the General Contractor if:

1) The conduit work is not being completed in accordance with the requirements indicated on the TEL drawings and this specification.

2) The conduit work is not being completed in such a manner that will allow the Structured Cabling System Contractor to complete his work in a timely manner in accordance with the project schedule and this section

The Structured Cabling System Contractor shall provide adequate training of the Owner’s forces prior to the date of occupancy and shall provide follow-up training after occupancy. Total training time shall be as prescribed by this specification is considered a minimum requirement.

1.5 EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

Prior to providing a proposal for this work, the Contractor shall visit the proposed site of work to become familiar with any condition that may affect the work to be performed in any way. No allowances shall be made because of lack of knowledge of these conditions.

The Contractor shall have total system responsibility to assure a fully operational system. Any additional labor and components required for the installation of complete operating systems but not specifically required by the bid documents shall be provided and the cost borne by the Contractor.

The Contractor shall remain the sole owner of the system and all of its components provided under this contract and is responsible for all risk of loss or damage of the system for the entire contract period up to and including the date and time of Final Acceptance by the Owner/Architect and the Owner's Project Manager. After the date of Final Acceptance, the Owner shall assume full ownership of the system with all components, and the warranty period shall commence.

1.6 QUALITY ASSURANCE

Materials shall be new and shall be the best of their respective kinds. All work shall be accomplished in a workmanlike manner in keeping with the best practices and highest standards of the telecommunications industry.

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until Final Acceptance by the Owner/Architect and the Owner.

1.7 CODES AND STANDARDS

All work done under this contract shall be performed in accordance with the most recent issue of the following codes, standards and guidelines. Where there is a perceived conflict between a standard or guideline and the contract documents, the Contractor shall perform the work as directed by the Owner/Architect.

NFPA 70	National Electric Code - 2020 Edition
NFPA 90A	Standard for the installation of Air-Conditioning and Ventilating Systems – 2021 edition
NFPA 101	Life Safety Code - 2021 Edition
FBC	Florida Building Code – 2020 7th Edition Florida Fire Prevention Code - 2020 7th Edition Florida Building Code Accessibility – 2020 7th Edition
TIA	Telecommunications Industry Association, current edition of each standard at the time of bids applies (regardless of edition indicated below)
TIA-568.0-D	Generic Telecommunications Cabling for Customer Premises
TIA-568.1-D	Commercial Building Telecommunications Infrastructure Standard
TIA-568.2-D	Balanced Twisted-Pair Telecommunications Cabling and Components Standard
TIA-568.3-D	Optical Fiber Cabling and Components Standard

TIA-568.4-D	Broadband Coaxial Cabling and Components Standard
TIA-569-D	Telecommunications Pathways and Spaces
TIA-598-B	Optical Fiber Cable Color Coding
TIA-526	Standard Test Procedures for Fiber Optic Systems (Singlemode Fiber Optical Power Loss measurement TIA-526-7 Revision A 2015 and Multimode Fiber Optical Power Loss measurement TIA-526-14 Revision C 2015).
TIA-606-C	Administration Standard for Commercial Telecommunications Infrastructure
TIA-607-C	Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA-758-B	Customer-Owned Outside Plant Telecommunications Infrastructure Standard
TIA-862-B	Structured Cabling Infrastructure Standard for Intelligent Building Systems
IEEE	Institute of Electrical and Electronics Engineers
	IEEE 802-2001, IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture
IEEE	LAN/MAN Bridging & Management (802.1)
	IEEE 802.1f-1993, IEEE Standard for Local and Metropolitan Area Networks: Common Definitions and Procedures for IEEE 802 Management Information
	IEEE 802.1h, 1997 Edition (R2001) (ISO/IEC TR11802-5: 1997), IEEE Technical Report and Guidelines--Part 5: Media Access Control (MAC) Bridging of Ethernet V2.0 in Local Area Networks
	IEEE 802.1b, 1995 Edition (ISO/IEC 15802-2-1995), IEEE Standard for Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Part 2: LAN/MAN Management
	IEEE 802.1d, 1998 Edition (ISO/IEC 15802-3:1998, IEEE Standard for Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Media access control (MAC) Bridges
	IEEE 802.1t-2001, Amendment to IEEE Std 802.1D, 1998 Edition IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Common specifications--Part 3: Media Access Control (MAC)

Bridges: Technical and Editorial Corrections

IEEE 802.1w-2001, IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Common specifications Part 3: Media Access Control (MAC) Bridges--Amendment 2--Rapid Reconfiguration [Amendment to IEEE Std 802.1D, 1998 Edition (ISO/IEC 15802-3:1998) and IEEE Std 802.1t-2001]

IEEE 802.1e, 1994 Edition, IEEE Standard for Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Part 4: System Load Protocol

IEEE 802.1g, 1998 Edition, Information technology--Telecommunications and information exchange between systems--IEEE standard for local and metropolitan area networks--Common specifications--Part 5: Remote Media Access Control (MAC) bridging

IEEE 802.1q-1998, IEEE standard for local and metropolitan area networks: Virtual Bridged Local Area Networks

P802.1s/D13, Draft IEEE Standard for Local and Metropolitan Area Networks--Amendment 3 to IEEE 802.1q Virtual Bridged Local Area Networks: Multiple Spanning Trees

IEEE 802.1u-2001, (Amendment to IEEE Std 802.1q, 1998 Edition) IEEE Standard for Local and metropolitan area networks--Virtual Bridged Local Area Networks--Amendment 1: Technical and editorial corrections

IEEE 802.1v-2001, (Amendment to IEEE Std 802.1q, 1998 Edition) IEEE Standards Amendment to IEEE 802.1q: IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks--Amendment 2: VLAN Classification by Protocol and Port

IEEE 802.1x2001 IEEE Standards for Local and Metropolitan Area Networks: Port-Based Network Access Control

IEEE CSMA/CD Access Method (802.3)

IEEE 802.3-2002® IEEE Standard for Information technology--Telecommunications and information exchange between systems-Local and metropolitan area networks--Specific requirements -Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. Incorporates the IEEE 802.3z Standard for 1000BASE-X Gigabit Ethernet over fiber optic cabling and the IEEE 802.3ab Standard for 1000BASE-T Gigabit Ethernet over copper UTP cabling.

IEEE 802.3ae-2002 (standard ratified June 2002)
Supplement to IEEE 802.3 CSMA/CD Access Method & Physical Layer Specifications - Media Access Control (MAC) Parameters, Physical Layer, and Management Parameters for 10Gb/s Operation

IEEE 802.3at Amendment: Data Terminal Equipment (DTE) Power Via

	the Media Dependent Interface (MDI) Enhancements (PoE Plus)
IEEE	Wireless LANs (802.11)
	IEEE Std 802.11, 1999 Edition, IEEE Standard for Information Technology - Telecommunications and Information Exchange between Systems - Local and Metropolitan Area Network - Specific Requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
	IEEE 802.11a-1999, Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Specific requirements—Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications—Amendment 1: High-speed Physical Layer in the 5 GHz band (An errata is available)
	IEEE 802.11b-1999 Supplement to 802.11-1999,Wireless LAN MAC and PHY specifications: Higher speed Physical Layer (PHY) extension in the 2.4 GHz band
	IEEE 802.11d-2001, Amendment to IEEE 802.11-1999, (ISO/IEC 8802-11) Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements--Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications: Specification for Operation in Additional Regulatory Domains
	IEEE 802.n-2009, Amendment 5 to IEEE 802.11-1999, Enhancements for Higher Throughput
	IEEE 802.11ac, Enhancements for very high throughput WLANs
	IEEE 802.11ax-2021 High Efficiency WLANs (WiFi-6)
BICSI	Building Industry Consulting Service International
	Telecommunications Distribution Methods Manual (TDMM) Latest Edition
	Network Design Reference Manual (NDRM) Latest Edition
	Outside Plant Design Reference Manual (OSPDRM) – Latest Edition
	Telecommunications Cabling Installation Manual (TCIM) Latest Edition
AT&T	"Outside Plant Engineering Handbook"

All materials and equipment shall be UL listed for the intended application.

1.8 PRE-INSTALLATION SUBMITTALS

A. Manufacturer's Catalog Data:

Submit five (5) copies of manufacturer's standard descriptive data sheets to the Owner/Architect for review and approval prior to commencing work. Furnish complete data sheets bearing the printed logo or trademark of the manufacturer for each type of product being provided. Mark each copy of the data sheets for the specific product being provided with an identifying mark, arrow, or highlighting. The following items shall be submitted:

1. Conduit and Pull Boxes, Fittings, Related Hardware & Accessories, each type
2. Handholes
3. Backboards (furniture grade AC plywood)
4. Cable Runway, Fittings, Related Hardware & Accessories, each type
5. Racks, Related Hardware & Accessories, each type
6. Enclosures and Cabinets, each type
7. WAP mounts, each type
8. Copper Patch Panels, each type
9. Copper Wiring/Patch Blocks, each type
10. Category 6 UTP Cable , each type
11. Category 6A Cable, each type
12. Category 6 and 6A horizontal patch panels, frames and inserts, each type
13. Burial grade Category 6 and Category 6A cables
14. Patch Cables - Copper and Fiber Optic, each type
15. Patch Cord Organizers and Cable Rings, each type
16. Wire Management Devices, each type
17. Communications Outlets (CO), each type
18. Special Purpose Outlets, each type
19. Raceway, each type
20. Power Surge Protectors
21. Uninterruptible Power Supplies (UPS), each type
22. Grounding Busbars and Lugs, each type
23. Firestopping Systems, each type
24. Labeling Products, each type
25. All other materials and equipment indicated to be furnished under this section, whether specifically listed here or not.

B. Pre-Installation Drawings:

As part of the Structured Cabling System installation, the Contractor shall provide detailed documentation to facilitate system administration, maintenance, and future moves, adds and changes. Drawings shall be provided which incorporate all information in the Contract Drawings, and which fully document any and all Owner/Architect approved changes in materials and methods made by the Contractor. Drawings are not required if no changes to the design are made by the Contractor. Changes to the design shall not be made without the prior written approval of the Engineer. Drawings shall provide the same level of detail as the bid documents. *Electronic files of the Engineer's AutoCAD drawings will not be provided to the Contractor*.

Drawings shall be prepared using AutoCAD Release 14 and shall be furnished in hard-copy format and on industry standard CD or ZIP drive media.

Submit five (5) copies of pre-installation drawings to the Owner/Architect for review and approval prior to commencing work.

1.9 CONTRACTOR'S RECORD DOCUMENTS

The Structured Cabling System Contractor shall maintain a full set of contract documents at

the job site at all times, consisting of specifications, drawings, addenda, pre-installation submittals, change orders, and change directives. The record documents shall be updated by the Contractor, in red pen and on a daily basis, to show the following:

1. Final location of all Communications Outlets, Wireless Access Points, and security cameras.
2. Final conduit routing.
3. Location of all buried utilities encountered during the course of work on this project.
4. Final location of all handholes, pull boxes, and access doors.
5. Any changes to the work authorized by the Owner/Architect.
6. Any other pertinent information that may be of value to the Owner in operating and maintaining the system.

The Contractor's record documents shall be available for viewing by the Owner/Architect at the site at any time and shall be presented and reviewed by the Contractor at each construction progress meeting. The record documents shall be clearly marked "Record Set", shall be kept in a protected location, and shall not be used for general construction purposes. The record documents shall be provided to the Owner/Architect at the close of the project.

The Owner/Architect will provide a full set of Adobe Acrobat *.PDF format drawings to the Contractor. The Contractor shall be required to annotate (redline) the Adobe Acrobat *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the Adobe Acrobat *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Engineer. The Contractor shall also provide 11”x17” laser prints of Adobe Acrobat *.PDF drawings in each O&M Manual.

PART 2 - PRODUCTS

2.1 GENERAL

All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects.

All products shall be the manufacturer and model or part number specified. Where a model or part number is indicated in error for any reason, the Contractor shall verify the intent of the Owner/Architect prior to providing a proposal and shall provide the product intended by the Owner/Architect. Where a manufacturer has updated or improved a product subsequent to issuance of the bid documents by the Owner/Architect, the Contractor shall provide the updated or improved product at no additional cost to the Owner.

Provide new equipment and materials only. Each component shall be the most recent model number, revision, or update offered by the manufacturer at the time of purchase by the Contractor. Newly manufactured containing used or rebuilt parts, remanufactured, rebuilt, reconditioned, used, shopworn, demonstrator or prototype equipment is not acceptable and will be rejected. Each major component of telephone and data systems equipment provided under this contract shall include a certification from the manufacturer stating that the equipment is new and referencing the serial number of the delivered equipment. The Contractor shall track the placement of each major component in the field and shall provide the Owner a list identifying each component by manufacturer, model number, serial number, and installed location (example rack number and rack position).

All materials, equipment and devices shall meet the requirements of UL where UL standards

are established for those items, and the requirements of NFPA 70.

All like items of material or equipment shall be the same product of the same manufacturer, model number and production series.

All materials and equipment shall be a standard catalogued product of a manufacturer regularly engaged in the manufacture of similar products.

2.2 PRODUCT SPECIFICATIONS

See drawings for all product requirements not indicated in these specifications. The Structured Cabling Contractor shall be responsible for providing and installing all components indicated in these specifications and on the drawings, unless specifically indicated to be provided by others.

A. Structured Cabling System:

Provide all system components as indicated the drawings. To ensure a uniform basis for bidding, and to standardize the Owner's facilities, base all bids on the particular systems, equipment and materials specified.

B. Data and Wireless Systems:

See drawings for data cabling system specifications and equipment mounting requirements.

Data equipment and wireless LAN equipment shall be Owner Furnished Contractor Installed (OFCI) as indicated on the drawings, unless specifically indicated otherwise.

Provide a system of data cabling as indicated on the drawings, to include wiring for Wireless Access Points, security camera systems and network interfaces to other systems as indicated on the drawings.

Wireless Access Points:

The Contractor shall install new WAPs furnished by the Owner at WAP locations indicated on the drawings and finalized by the Owner. WAPs shall be Owner Furnished Contractor Installed (OFCI) as indicated on the drawings. WAP mounts shall be Contractor Furnished Contractor Installed (CFCI).

The Structured Cabling System Contractor shall provide two new Category 6A cables to each new and WAP location in support of Owner furnished equipment. Direct terminate and test, coil slack in associated mounting box.

C. Telephone System:

See drawings for voice cabling system specifications.

The Owner will provide VOIP equipment, handsets and all programming and system setup.

PART 3 - EXECUTION

3.1 GENERAL

The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written recommendations, and the contract drawings and these specifications.

Workmanship shall be of the highest grade in accordance with the best modern practice and the highest standards of the telecommunications industry.

The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration and repair.

The completed installation shall meet with the approval of the Owner’s Project Manager and the Owner/Architect.

The General Contractor and the Structured Cabling System Contractor (SCSC) shall share full responsibility for protecting all communications outlets, the CER and CC and all structured cabling system components from dust and debris during construction and until final completion of the project. The SCSC shall not install racks, wire managers, patch panels, protector blocks, 66 blocks, or dress out and terminate cables until paint, backboards and floors in the CER are completely finished and those rooms are completely isolated from dust infiltration with plastic sheeting and duct tape. All COs jacks shall be protected by bagging and sealing dust tight at all times after connectivity devices are installed. All system components that, in the sole judgment of the Owner/Architect, are exposed to excessive accumulation of construction dust/debris at any stage of the project shall be removed and replaced with new components at no additional cost to the Owner. Lay-in ceiling grids in the CER and CC shall be installed after conduits and cable trays and cable runways have been installed to allow the ceiling installer to trim around conduits. Lay- in ceiling tiles in these areas should follow completion of cable dressing into racks.

The SCSC shall not install racks, wire managers, patch panels, protector blocks, 66 blocks, or dress out and terminate cables until paint, backboards and floors in the CER and CC are completely finished and those rooms are completely isolated from dust infiltration with plastic sheeting and duct tape.

A. Delivery:

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition in original factory sealed cartons and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for receiving and storing of all equipment and materials and shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until Final Acceptance by the Architect and the Owner.

B. Data Equipment:

See drawings for data cabling system specifications. Provide a system of data cabling as indicated on the drawings, to include wiring for Wireless Access Points, security camera systems and network interfaces to other systems as indicated on the drawings.

Data equipment and wireless LAN equipment shall be Owner Furnished Contractor Installed (OFCI) as indicated on the drawings, unless specifically indicated otherwise.

Wireless Access Points:

The Contractor shall install new WAPs furnished by the Owner at WAP locations indicated on the drawings and finalized by the Owner. WAPs shall be Owner Furnished Contractor Installed (OFCI) as indicated on the drawings. WAP mounts shall be Contractor Furnished Contractor Installed (CFCI).

The Structured Cabling System Contractor shall provide two new Category 6A cables to each WAP location in support of Owner furnished WAP equipment. Direct terminate and test, coil slack in associated mounting box.

Power Cords: The Structured Cabling System Contractor shall route Owner furnished power cords connecting all Owner Furnished data equipment to rack power strips or uninterruptible power supplies as indicated on the drawings. Cords shall route from equipment, up or down on racks attached to standoff brackets as indicated on drawings, and over to rack power strips or UPS connections. Properly routed and secure at 12 inches on center, with only one cord allowed per connection, and neatly coiling excess cord length and securing coil with black velcro.

Coordinate all related work with the Owner's Project Manager and District IT staff.

C. Telephone System:

The Owner will provide a VOIP based telephone system with handsets (OFOI).

Provide and install patch cords from VOIP connections to horizontal wiring connections as specified herein and as indicated on the drawings.

See drawings for specific requirements.

Coordinate all work with the Owner and the telephone service provider.

F. Conduit Installation:

All conduit shall be installed by a licensed electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents.

All backbone cabling shall be run continuously in conduit.

The following horizontal cabling, along with any other cabling so indicated on the drawings shall be run continuously in conduit:

1. All Category 6 cabling for special circuits shall be run continuously in conduit.
2. All Category 6 cabling for the IP Security Camera System shall be run continuously in conduit.
3. All Category 6 and 6A cabling run in exposed structure spaces without ceilings limited to mechanical equipment rooms, electrical equipment rooms and storage rooms with no ceilings, shall be installed continuously in conduits extended to accessible lay-in ceiling areas at each end.
4. All Category 6 and 6A cabling run above hard ceilings shall be installed continuously in conduits extended to accessible lay-in ceiling areas at each end.
5. Where specifically indicated elsewhere horizontal cabling shall be installed continuously in conduit.
6. SEE DRAWINGS FOR SPECIFIC AREAS OF THE BUILDING EXPOSED ROOF

STRUCTURE BUT WHERE EXPOSED CONDUIT OR CABLING IS PROHIBITED AND UNDERGROUND CONDUIT AND BURIAL GRADE HORIZONTAL CABLE ARE REQUIRED. THE CM SHALL COORDINATE ALL SUCH WORK CLOSELY WITH THE ELECTRICAL CONTRACTOR AND THE STRUCTURED CABLING SYSTEM CONTRACTOR TO ENSURE THAT NO CABLE OR CONDUIT IS RUN EXPOSED IN THESE AREAS EXCEPT WHERE SPECIFICALLY INDICATED.

Do not pull cables in conduits until plastic insulating bushings have been installed. Cables installed in conduits without plastic insulating bushings shall be removed and replaced with new cables.

Rack conduits and run together wherever possible.

Conduit shall be installed with top-grade workmanship, using factory bends or field bends made with the proper tools. Kinked, dented or otherwise improperly constructed bends will not be accepted. All bends shall have a minimum radius of six times the internal conduit diameter.

All conduit shall be routed parallel and perpendicular to building lines, up high and over piping, ductwork, conduit and other utilities. Conduit in exposed locations shall be run as high as possible, secured with heavy duty galvanized two-hole supports, and otherwise installed to prevent damage from pulling, hanging, etc.

Install plastic insulating bushings on the ends of all conduits prior to installing cables. Provide conduit end fitting with threaded end and threaded plastic insulating bushing on all EMT conduit ends. Provide UL listed threaded malleable iron insulated grounding bushing on all IMC or RMC conduit ends – add on grounding clamps will not be accepted. Cables installed without plastic insulated bushings or insulated grounding bushings in place shall be removed, the proper bushings installed, then the cables reinstalled, terminated and tested – no exceptions will be made to these requirements.

Firestop all conduit penetrations of all walls that extend to the underside of the roof deck above. Firestop all conduit penetrations of all walls that do not extend to the underside of the roof deck above but are indicated as fire rated on the drawings. Accomplish firestopping using UL classified systems with fire rating equal to or greater than the fire rating of the floor or wall assembly penetrated. Firestop systems shall be 3M, Nelson or Owner approved equal. Install in strict accordance with the manufacturer's printed instructions and the conditions of the UL approval for each firestop system used.

All conduit penetrations of walls that do not extend to the underside of the roof deck above shall be sealed smoketight and acoustically with smoke-sound caulking UL listed for the purpose such as USG Firecode, STI Smoke ‘N’ Sound, or Hilti CP 506.

All buried conduit shall be Schedule 80 electrical grade PVC conduit. All PVC conduit joints shall be cleaned and glued for a watertight connection. Terminate ends of PVC conduit at closets and handholes with end bells.

Seal all underground conduits at handholes and at building entry points following cable installation to prevent the entry of water into buildings, and to prevent the entry of water or debris into the conduits from the handhole or building side. Sealant shall be POLYWATER FST-250 and shall be installed using factory caulking tube, mixing nozzle, damming strips (all included in FST-250KIT1) package.

Buried warning and identification tape: Provide metallic detection tape manufactured specifically for warning and identification of buried utilities. Install tape directly above each buried conduit at depth of 10 to 12 inches below grade for entire length of conduit. Tape shall be detectable by

any standard Non-Ferric Metal Detector. Provide tape in rolls, 2 inches minimum width, color orange, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Warning and identification shall read "CAUTION BURIED COMMUNICATIONS LINE BELOW". Use permanent code and letter coloring unaffected by moisture and other substances contained in backfill material.

Underground Conduit Validation:

Following installation of underground conduits, perform the following operation for each conduit:

Clean, lubricate and validate each installed conduit for serviceability by running a full size rubber duct swab through the conduit from end to end. Conduits that are obstructed may be cleaned using a wire brush mandrel, then revalidated with the full size rubber duct swab. Conduits that do not allow passage of the full size rubber duct swab shall be replaced.

Pull Tapes: As backbone cabling runs are installed, provide a continuous marked pull tape (Carlon TL3821800 lb. tensile strength) for the full length of the end-to-end cable run with 10 feet of slack at each end pulled in alongside cabling. Bundle slack neatly at each end and tie off to conduit support strut at each end. Provide continuous factory uncut lengths of pull tape from end-to-end - under no circumstances shall pull partial length section of pull tape be tied together.

Spare Conduits: For conduits that are indicated as spare, install a continuous marked pull tape (Carlon TL382 1800 lb. tensile strength) for the full length of the end-to-end conduit run with 10 feet of slack at each end, tie each end of the tape to a blank duct plug with rope tie tab, push slack tape back into conduit, and install a duct plug in each conduit end for a watertight seal.

G. Cabling Installation:

SEE DRAWINGS FOR SPECIFIC AREAS OF THE BUILDING EXPOSED ROOF STRUCTURE BUT WHERE EXPOSED CONDUIT OR CABLING IS PROHIBITED AND UNDERGROUND CONDUIT AND BURIAL GRADE HORIZONTAL CABLE ARE REQUIRED. THE CM SHALL COORDINATE ALL SUCH WORK CLOSELY WITH THE ELECTRICAL CONTRACTOR AND THE STRUCTURED CABLING SYSTEM CONTRACTOR TO ENSURE THAT NO CABLE OR CONDUIT IS RUN EXPOSED IN THESE AREAS EXCEPT WHERE SPECIFICALLY INDICATED.

Do not pull cables in conduits until plastic insulating bushings have been installed. Cables installed in conduits without plastic insulating bushings shall be removed and replaced with new cables.

Cabling free-routed above ceiling: Category 6 and Category 6A cables allowed to be free-routed shall be free-routed only where concealed above lay-in ceilings only for those applications not identified to run continuously in conduit. Install horizontal cabling shown to be free-routed parallel and perpendicular to building lines, up high and over piping, ductwork, conduit and other utilities, and in protected locations. All cabling shall be neatly and symmetrically bundled (maximum individual bundle size shall be as indicated on the drawings), bound with black velcro wraps at a minimum of four feet on center, properly supported, and otherwise installed as indicated on the drawings. Support all free-routed horizontal cabling bundles individually with Category 5 J-hooks (Erico Caddy as indicated on drawings) at a minimum of four feet on center. Attach J-hooks to building structural members only using factory support system components. Secure cables bundles within J-hooks with factory contact free containment cable ties. Do not attach J-hooks to ceiling grids, ceiling supports, piping, ductwork, conduit or anything other than building structural members unless specifically approved by the Engineer. Do not support free-routed horizontal cabling by running over or directly attaching to building structural members, piping, ductwork, conduit or any other utility.

Conduit sleeves for free-routed horizontal CAT 6 and CAT 6A: Final routing paths for free-routed horizontal cabling shall be determined by the contractor in the field. For this reason conduit sleeves are not indicated on the drawings. The contractor shall provide EMT conduit sleeves in the quantities and locations required to suit the contractor selected horizontal cable routing and as required for a complete installation, regardless of whether those sleeves are indicated on the drawings or not, and at no additional cost to the Owner. At locations where horizontal cabling runs through mechanical or electrical equipment rooms, the riser room, or storage rooms with exposed structure ceiling, all such cabling shall be run in continuous conduit sleeves extending to the nearest accessible lay-in ceiling at both ends. In addition, the contractor shall provide conduit sleeves traversing inaccessible (hard) ceiling or soffit areas and extending to the nearest accessible lay-in ceiling at both ends for cable pass-thru - provide access panels in inaccessible ceilings as required to install sleeves. Sleeves shall be sized for maximum 30 percent cable fill and shall be constructed and provided with pull boxes and access doors per the general aboveground conduit notes on the drawings. General contractor paint exposed conduit sleeves in all finished/occupied spaces with no ceilings to match adjacent surfaces.

Provide wire management devices on backboards and racks as indicated and as required to facilitate organized routing of cables and patch cords. Bundle cables together behind racks and fan out to points of termination. The finished installation shall meet the approval of the Owner/Architect for overall quality and neatness of appearance.

The Contractor, in providing a bid for the system in accordance with the contract documents, agrees to install all cabling in the conduit and wireway paths indicated in the contract documents, or to provide larger conduit and wireway paths as he deems necessary, at no additional cost to the Owner. The Contractor shall be fully responsible for any and all damage to cabling that may occur during the installation and shall replace any damaged cabling with new cabling of the type specified for the application.

Firestop all cable penetrations of all walls that extend to the underside of the roof deck above. Firestop all cable penetrations of all walls that do not extend to the underside of the roof deck above but are indicated as fire rated on the drawings. Accomplish firestopping using UL classified systems with fire rating equal to or greater than the fire rating of the floor or wall assembly penetrated. Firestop systems shall be 3M, Nelson or Owner approved equal. Install in strict accordance with the manufacturer's printed instructions and the conditions of the UL approval for each firestop system used.

All cable penetrations of walls that do not extend to the underside of the roof deck above shall be sealed smoketight and acoustically with smoke-sound caulking UL listed for the purpose such as USG Firecode, STI Smoke ‘N’ Sound, or Hilti CP.

H. Identification and Labeling:

The Structured Cabling System Contractor shall purchase and use professional labeling software and labeling products to generate all labels for this project, with the exception of engraved plastic tags and laminated paper tags, which shall be fabricated as indicated below. The Contractor shall determine the proper labeling product for each application and include a list of each product and application with the Pre-Installation Submittals.

All labels shall be produced using a laser printer and shall be clear and easily readable. Minimum text size shall be 12 point. Text font shall be ARIAL or ARIAL NARROW. Handwritten labels are not acceptable.

Label each horizontal cable and backbone cable using self-adhesive self-laminating polyester wrap-around labels with laser printed text as follows:

Label each Horizontal Category 6 and Category 6A cable cable at each end. Label text shall be based on the nomenclature required by I.T. personnel.

Label each Fiber Optic Backbone and Voice Backbone Cable at each end. Label text shall be based on the nomenclature required by I.T. personnel.

Label each Communications Outlet using non-adhesive card labels with laser printed text. Insert labels under outlet manufacturer's plastic label covers centered and straight. Label text shall be based on the Communication Outlet Identification Nomenclature and labeling details required by I.T. personnel.

Label each Category 6 and Category 6A Horizontal Patch Panel port using non-adhesive or self-adhesive labels with laser printed text. The Contractor shall first attach the adhesive labels to the perforated paper labels supplied by the patch panel manufacturer, then insert the paper labels into the plastic covered icon-label holders supplied by the patch panel manufacturer. Label text for each patch panel port shall be based on the Horizontal Patch Panel Labeling Nomenclature and labeling details required by I.T. personnel.

Label each Backbone Fiber Optic Cable Drawer with 1" high bold text printed on clear self-adhesive paper and attached to the reverse side of drawer manufacturer's paper label. Label text shall be based on the 'Fiber Optic Backbone Cable Nomenclature' required by I.T. personnel to indicate source (CER) and each destination (respective CC or CP).

Label each Communications Panel, Rack, Voice Protector Block, Voice Backbone Patch Panel and other devices as required by I.T. personnel.

Provide data sheets describing all proposed labeling products with Pre-installation Submittals.

3.2 CABLE TESTING

A. General:

Prior to installation of cabling, visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport. Return visibly damages goods to the supplier and replace with new.

If post-manufacture performance data has been supplied by the manufacturer of cables or connecting hardware, copies of such data are to be kept for inclusion in the Documentation and made available to the Owner upon request.

After cabling installation and labeling is complete, but prior to the installation of patch cords, the Contractor shall test all cables. As part of cable test procedures verify all labeling and correct all inaccurate labeling.

The Contactor shall be in responsible charge of all cable testing procedures and shall provide an original signed letter in each project Operation & Maintenance (O&M) manual certifying that all cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein.

Tests shall be performed in strict accordance with the test instrument manufacturer's

printed instructions.

One hundred percent of all cables shall be tested.

Technicians performing testing shall be thoroughly trained in the use of the test instruments employed. Factory certification of technicians is mandatory. The Contractor shall provide evidence of training and copies of certificates to the Owner/Architect.

The Contractor is responsible for supplying all test equipment and related materials required to test the entire Structured Cabling System. Test instruments shall be calibrated and traceable to the National Institute of Standards (NIST). Test instruments shall have been recently calibrated. The Contractor shall provide evidence of test instrument calibration if requested by the Owner/Architect.

The requirement for this project is full compliance/zero tolerance. Cables that do not comply with the stated standards shall be removed and replaced with new. Partial use of cables by claiming good pairs or strands and abandoning others is not allowable. Defective cables shall be removed and replaced with new.

Notify the Owner in writing not less than five days prior to commencing cable testing. The Owner may elect to be present for and witness cable testing.

The Contractor shall be required to retest installed cables in the Owner's presence to verify the Contractor's test documentation. The percentage of cables to be retested shall be determined by the Owner based on compliance of the installation with the contract documents, quality of workmanship, and results of initial cable tests. Retesting shall be performed as required until all cables, in the judgment of the Owner, comply with the requirements of the contract documents.

B. Cable Test Results:

All cable test results shall be provided as part of the project Installation and Maintenance (O&M) Manuals.

C. Category 6 UTP Cable

Testers:

Each Category 6 cable shall be tested with Fluke Networks DSP-4300 Digital Cable Analyzers utilizing Fluke Networks DSP-LIA101 Universal Permanent Link Interface Adapters and the appropriate Personality Modules. In addition, each tester shall be calibrated prior to commencing testing for this project using a Fluke Networks DSP-PLCAL Universal Permanent Link Calibration Kit and Fluke Networks ‘Cable Manager’ software.

Prior to testing, electronically update tester software using the tester manufacturer’s ‘Cable Manager’ software update utility. Update to the software version current at time tests are performed. Under no circumstances shall a tester with outdated software be used.

General:

Testing shall be of the Permanent Link. However, the Structured Cabling System Contractor and the Structured Cabling System Manufacturer shall warrant performance based on

Channel performance and provide shall patch cords that meet Channel performance requirements.

All test results shall be maintained in the native file format of the tester manufacturer's 'Cable Manager' software. Under no circumstances shall be data be modified by other software, edited in any manner, or exported to a database, spreadsheet, work processor program or any other type of program that would allow access to the data for modification. Hardcopy printouts of test reports in Summary Format shall be generated directly from the 'Cable Manager' software. Detailed test results in Text Format shall be provided to the Owner in native 'Cable Manager' data format on a CD. In addition, detailed test results in Text Format shall be provided to the Owner in Adobe Acrobat *.PDF format on a CD. CDs shall be included in the project Operation and Maintenance (O&M) manuals.

Record all test conditions and setup parameters and include in a typed discussion to be provided with test documentation.

Verify correct labeling of patch panels and communications outlets prior to and during testing. If any label is found to be in error, correct before proceeding with testing. Circuit Identification (cable I.D.) in cable test reports shall be exactly the same as the outlet labeling based on the nomenclature required by I.T. personnel.

Testing:

After installation, termination and labeling of the Category 6 UTP cable is complete and approved by the Structured Cabling System Contractor's RCDD, test each cable in accordance with all applicable TIA/EIA standards for UTP Category 6, and complete all operations required for a Panduit Certified Cabling System and 25 year System Warranty.

Prior to testing, electronically update tester software using the tester manufacturer's 'Cable Manager' software update utility. Update to the software version current at time tests are performed. Under no circumstances shall a tester with outdated software be used.

Test each cable to verify compliance with TIA/EIA specifications for Category 6 UTP, Permanent Link configuration, Level III accuracy, with no allowable deviation. Test at the full range of frequencies indicated by TIA/EIA up to and including 250 MHz.

Test using the tester manufacturer's standard TIA/EIA Category 6 Autotest. Under no circumstances shall a Custom Cable Autotest designed by the tester manufacturer specifically for a given cable manufacturer or structured cabling system manufacturer be used to test cables. All tests and testing procedures for this project shall be strictly based on TIA/EIA standards. Enter the proper Nominal Velocity of Propagation (NVP) for the specific cable(s) installed. Test for the following parameters:

1. Wire Map – verify no shorts, opens, miswires, split, reversed or crossed pairs, and end-to- end connectivity is achieved.
2. Cable Length
3. Insertion Loss (attenuation)
4. NEXT Loss
5. PSNEXT Loss
6. ELFEXT Loss
7. PSELFEXT Loss

8. Return Loss
9. ACR
10. PSACR
11. Propagation Delay
12. Delay Skew

Documentation:

Test documentation for Category 6 cabling shall include the following:

1. An introductory discussion documenting each test instrument used, the Autotest routine used on each test instrument, qualifications of operators, test conditions, setup parameters, and any other pertinent information.

2. A summary hardcopy printout for all cables using the tester manufacturer's standard 'Cable Manager' software to produce an "AutoTest Summary" report. The summary report shall include Project Name, Circuit I.D., Result (pass or fail) and the cable length. The report shall be printed directly out of the 'Cable Manager' program in native format and in *.PDF format – under no circumstances shall the data be exported to any other type of program at any time.

3. A full-page text only detailed test result for each cable using the tester manufacturer's standard 'Cable Manager' software to produce an "AutoTest Report". Each report shall be printed directly out of the 'Cable Manager' program in native format and in *.PDF format
- under no circumstances shall the data be exported to any other type of program at any time. Each report shall include the following components:

   - Tester manufacturer, model, serial number, hardware version, and software version
   - Project Name
   - Operator Name
   - Cable manufacturer, cable part number/type and NVP
   - Circuit I.D.
   - Autotest specification used (must be standard TIA Category 6 autotest)
   - Identification of the tester interface used
   - Overall pass/fail indication
   - Date of Test
   - Wire Map
   - Cable Length in feet
   - Insertion Loss (attenuation)
   - NEXT Loss*
   - PSNEXT Loss*
   - ELFEXT Loss*
   - PSELFEXT Loss*
   - Return Loss*
   - ACR*
   - PSACR*
   - Propagation Delay
   - Delay Skew

   * Measure from both ends of each cable

4. A PASS or FAIL result for each parameter shall be determined by comparing the

measured values with the specified test limits for that parameter. The test result for each parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer shall provide documentation as an aid to interpret results marked with asterisks.

Each individual test that fails the relevant performance specifications shall be marked as FAIL or FAIL*. Any FAIL or FAIL* result yields a FAIL rating for the link-under-test. In order to achieve an overall PASS rating, the results for each individual test parameter must yield a PASS or PASS* result.

5. Cable identities (Circuit IDs) shall be based on the labeling nomenclature required by I.T. personnel

6. Transfer of Software to Owner: Provide tester manufacturer's 'Cable Manager' software, latest version, to the Owner for the Owner's use in viewing and managing test results.

7. Provide all Category 6 cable test documentation in the project O&M Manuals. Category 6 Cable Performance Criteria:

   If the test results for any cables, in the sole judgment of the Owner/Architect, fail to confirm acceptable performance, the Contractor shall reconnectorize or replace with new the affected cables as required to achieve specified performance levels as demonstrated by retesting.

D. Category 6A UTP Cable

The Structured Cabling System Contractor shall provide a Category 6A tester and shall test all Category 6A cabling for the Permanent Link in strict accordance with TIA standards for Category 6A testing and characterized to 500 MHz. The contractor shall provide a full test report equivalent in scope to the report required above for Category 6 cabling.

The final test report shall indicate that each Category 6A cable achieved a PASS rating without exception.

If the test results for any cables, in the sole judgment of the Owner, fail to confirm acceptable performance, the Contractor shall reconnectorize or replace with new the affected cables as required to achieve specified performance levels as demonstrated by retesting.

E. Fiber Optic Cable

Testing: General:

Clean all fiber optic connectors, sleeves and test cords prior to testing. Follow all other recommendations of the test instrument manufacturer for cable and instrument preparation.

Record all test conditions and setup parameters and include in a typed discussion to be provided with test documentation.

On-the-Reel-Testing:

Before commencing the installation and with the cable on the reel, test at least one fiber strand on each cable reel to verify that the cable is undamaged. Record and print test results for future reference.

Post-Installation Testing:

After installation, termination and labeling of fiber optic cable is complete, test each strand of fiber to verify that the installed cable meets the performance requirements described below. Prior to test clean all terminated fiber ends and ensure that terminations are properly polished. Test in accordance with applicable TIA standards with the additional (and more stringent) requirements following:

Test singlemode fiber at TIA Tier 2 using both a Optical Loss Test Set (OLTS) and a Optical Time Domain Reflectometer (OTDR). Test criteria shall be as required by applicable TIA standards and the following requirements. Cable specifications shall be based on maximum attenuation of 0.40 dB/km @ 1310nm and 0.30 dB/km @ 1550 nm. Test as follows:

1. Test two fiber links at the two specified wavelengths simultaneously. Perform bi-directional testing on both strands of the fibers-under-test and save results in one record.
2. Measure length for each cable link.
3. Measure attenuation for each cable link.
4. Utilize tester software to store test results and to generate reports.

Test results shall include all TIA test parameters including length and attenuation at each wavelength for each fiber link (terminated strand). Attenuation shall be the worst case result yielded from bi-directional testing. OTDR Trace results for each strand shall also be include in graphical format. All test results shall be maintained in the native file format of the tester manufacturer’s test management software. Under no circumstances shall be data be modified by other software, edited in any manner, or exported to a database, spreadsheet, work processor program or any other type of program that would allow access to the data for modification.

Detailed test results in Text Format shall be provided to the Owner in native tester management software format on a CD. In addition, detailed test results in Text Format shall be provided to the Owner in Adobe Acrobat *.PDF format on a CD. CDs shall be included in the project Operation and Maintenance (O&M) manuals.

Insert all fiber optic cable test documentation in the project O&M manuals.

Fiber Optic Cable Performance Requirements:

Each link of the installed fiber optic cabling, with mated connectors at each end, shall have a total attenuation (in db) less than or equal to the manufacturers' performance specifications for the cable and connectors called for in the contract documents, with the cable attenuation adjusted for the installed length, and with an allowable deviation of +0.25 db. If the test results for any strand, in the sole judgment of the Owner, indicate excessive attenuation based on these requirements, the Contractor shall repolish, reconnectorize, or replace the entire affected cable as required to achieve the specified performance levels for each strand as demonstrated by retesting.

The Contractor should note that these specifications are more stringent than the TIA criteria in terms of allowable link attenuation and shall plan the installation accordingly.

3.3 Patch Cord Installation:

Prior to Equipment Verification, the contractor shall install patch cords in a neat and workmanlike manner using the wire management devices indicated on the drawings. The contractor shall work side by side with the Owner's IT Staff throughout the entire patch cord installation for purposes of coordination and training.

Prior to installation of patch cords, the contractor shall account for all patch cords in the presence of the Owner's Project Manager and the Owner's IT Staff and shall present to the Project Manager a typed inventory of the patch cords broken down by type and length as scheduled on the drawings. The Owner's Project Manager will verify patch cord types, quantities, and lengths and will sign the inventory indicating that the contractor has delivered patch cords to the job site in accordance with the requirements of the contract documents. The contractor shall provide a copy of the inventory, signed by the Owner's Project Manager, in the O&M Manuals.

The signature of the Owner's Project Manager does not indicate acceptance of ownership of the patch cords by the Owner. Ownership of patch cords shall be transferred to the Owner at the same time as the project as a whole.

Following verification of patch cords types, quantities and lengths by the Owner's Project Manager, the contractor shall complete the patch cord installations as follows:

A. Data and VOIP Copper Patch Cords – CER and CC:

Install data patch cords connecting each port of all data equipment from data equipment connections to horizontal patch panels. Horizontal wiring connections to be made active shall be as directed by the Owner's Project Manager and the Owner's IT Staff in the field.

Provide a typed cross-reference list in Microsoft Excel spreadsheet format identifying data equipment ports and corresponding horizontal wiring connections – place hardcopy and CD of spreadsheet in three ring binder and mount binder on the backboard adjacent to the racks. Provide additional hardcopy and CD in O&M Manuals. Email copy of Excel Spreadsheet to the Owner's Project Manager.

Patch cords shall be neatly routed and bundled with black velcro at 6 inches on center in wire management devices from connection to connection. Patch cord lengths shall be selected by the Contractor from the stock supplied under the project to provide a neat installation in the racks and wire management systems without excess length. Note - Bundle data patch cords together – do not mix data patch cord bundles with voice patch cord bundles or fiber optic patch cord bundles. The entire installation shall require the site approval of the Owner/Architect.

B. Fiber Patch Cords – CER and CC:

Install fiber optic patch cords to connect all data equipment fiber optic ports as directed by the Owner's Project Manager and IT Staff in the field. Patch cords shall be neatly routed and bundled with black velcro at 3 inches on center in wire management devices from connection to connection. Patch cord lengths shall be selected by the Contractor from the stock supplied under the project to provide a neat installation in the racks and wire management systems without excess length. Note - bundle fiber optic patch cords together – do not mix fiber optic patch cord bundles with data patch cord bundles or voice patch cord bundles. The entire installation shall require the site approval of the Owner/Architect.

C. Workstation Patch Cords

The Contractor shall, in coordination with the Owner's Project Manager and IT Staff, install workstation data patch cords in the locations designated by the IT Staff as described above for connection of equipment room data patch cords to horizontal wiring connections. In addition, the Contractor shall work side by side with the Telephone System Provider to install telephone line cords as telephone instruments are set.

3.4 EQUIPMENT VERIFICATION

After installation of patch cords and before System Startup, the Contractor shall assist the Owner to power-up all data equipment and verify proper operation. The Contractor shall coordinate with the Owner to verify all cable interfaces are working and operational with the equipment. The contractor shall make any cabling system changes and additions as necessary and/or provide patch cables as required to complete the installation.

3.5 FINAL CLEANUP

Prior to the Substantial Completion Inspection, perform final cleanup of all work and all areas in which work was performed. All work areas shall be left vacuum clean. All raceway, faceplates, jack assemblies, racks, panels, data equipment, and the like shall be thoroughly wiped down to remove small amounts of dust accumulated during the course of the project. Jacks, patch panels, wiring blocks and data and voice equipment shall be cleaned with a high powered vacuum cleaner to completely remove internal dust. All painted surfaces such as backboards shall be touched up with paint to remove scuff marks, pencil marks, scratches, etc. All factory surfaces shall be touched with matching paint obtained by the Contractor from the factory.

3.6 CLOSE-OUT DOCUMENTATION

A. Operation & Maintenance Manuals:

Provide O&M Manuals as required by the architectural specifications and as follows.

The O&M Manuals shall contain sufficient information to permit Owner personnel to operate the system with or without assistance from the Contractor.

The Contractor shall provide O&M Manuals covering all equipment and materials furnished under this contract. The O&M Manuals shall contain all information necessary for the operation, maintenance, parts procurement, and parts replacement for the structured cabling system. The information shall include detailed documentation for firmware configuration.

Quantity: Three (3).

Format: *Provide 8-1/2" x 11" loose-leaf 3-ring binders with clear vinyl overlay designed to receive identification inserts. 3-ring binders shall be heavy- duty D-Ring type, over-sized to allow the insertion of additional system documentation in the future.*

Project Identification: Furnish project identification *inserted under the clear vinyl overlay on the front cover and the back spline as follows:*

Operating & Maintenance Manual
Project Name
Structured Cabling System Contractor

Project Information: On the front page, *enclosed in a 3-ring clear plastic sheet protector*, provide the following information:

Project Name
Structured Cabling System Contractor Name
Structured Cabling System Manufacturer
Name Electrical Contractor Name
Contractor's Project Manager
Contact list with name, address, contact person, phone number, and fax number for the each of the following:

Structured Cabling System Contractor
Structured Cabling System
Manufacturer Electrical Contractor

Index: On the second page, *enclosed in a 3-ring clear plastic sheet protector*, provide an index indicating the following section numbers and titles.

Sections: All sections shall be separated with an appropriate tabbed section divider with the appropriate number and title (typed) as follows:

Section 1 – Cuts Sheets:

Manufacturer's original data/cut sheets for each system component. Section 2 – Data Equipment List:
Typed list of each item of data equipment (including Owner furnished data equipment) with brief description, serial number, and part number. Note where each item of equipment is installed (CER/CC number, rack number and mounting position in rack). *Enclose in a 3-ring clear plastic sheet protector.*

Section 3 – Factory Manuals:

Manufacturer's printed Installation and Operating Manuals for each item of equipment provided by the Contractor. *Provide 3-ring zip-lock pockets for each manual that is not factory 3-ring hole punched*. Do not include manuals loose or inserted in binder pockets.

Section 4 - Warranties:

- Copy of Structured Cabling System Contractor's and 3 year warranty. *Enclose in a 3-ring clear plastic sheet protector.*
- Copy of Manufacturer's printed warranty for each item of equipment. *Enclose in a 3-ring clear plastic sheet protector.*

Section 5 - Transmittal of Loose Items:

Copy of transmittal to the Owner of all loose items such as patch cords, spare surge protectors, spare parts, etc. signed-

off by the Owner. *Enclose in a 3-ring clear plastic sheet protector.*

Section 6 - Documentation of Training:

Documentation of training signed-off by the Owner's Project Manager. *Enclose in a 3-ring clear plastic sheet protector.*

Section 7 - Cable Test Results:

Part 1 – RCDD Certification:

Provide written Certification of Contractor's RCDD, stating that all fiber optic, Category 6 and Category 6A cables have been tested in compliance with the contract documents and have met or exceeded the requirements stated therein. *Enclose in a 3- ring clear plastic sheet protector.*

Part 2 – Executive Summary:

Provide Hardcopy Summary Report of test results in the following divisions:

- Category 6 and Category 6A Cabling – Generate report directly from Fluke Networks 'Cable Manager' software.
- Fiber optic backbone cabling – Generate report directly from Fluke Networks 'Cable Manager' software.

Enclose each report in a 3-ring clear plastic sheet protector.

Part 3 – Fiber Optic Cables:

Provide detailed printed test results for all fiber optic cables. *Test results shall be printed on a laser printer. Enclose hardcopy in a 3-ring clear plastic sheet protector.*

Part 4 – Category 6 and Category 6A Cables:

Provide CD with Category 6 and Category 6A cable text only test results in native Fluke Networks 'Cable Manager' software *.FCM format and in Adobe Acrobat *.PDF format. *Place CD in 3-ring clear plastic CD jacket.*

Part 5– Fiber Optic Backbone Cables:

Provide CD with fiber optic backbone cable test results in native Fluke Networks 'Cable Manager' software *.FCM format and in Adobe Acrobat *.PDF format. *Place CD in 3-ring clear plastic CD jacket.*

Section 8 - Patch Cord Spreadsheet (voice and data):

Provide Hardcopy and CD of Excel Spreadsheet file.
Enclose hardcopy in a 3-ring clear plastic sheet protector. Place CD in
3-ring clear plastic CD jacket.

Section 9 – Annotated Adobe Acrobat *.PDF As-Built Drawings.

Provide 11”x17” hardcopy laser prints and CD of *.PDF files.
Enclose hardcopy in a 3-ring clear plastic sheet protector. Place CD in 3-ring clear plastic CD jacket.

B. As-Built AutoCAD Drawings:

Provide the same AutoCAD drawings as required under paragraph "Pre-Installation AutoCAD Drawings". Modify and correct to accurately reflect the finished installation. Provide five (5) hard-copies and two (2) sets of electronic media.

Submit As-Built AutoCAD Drawings to the Owner/Architect at the Substantial Completion Inspection. Provide transmittal letter addressed to the Owner/Architect indicating that the Contractor is providing five (5) hard-copies and two (2) sets of electronic media of the As-Built AutoCAD Drawings.

C. Red-Line Record Documents:

Refer to paragraph "CONTRACTOR'S RECORD DOCUMENTS". Provide Record Documents, updated in red pen, to accurately reflect the finished installation.

Submit Red-Line Record Documents over to the Owner/Architect at the Substantial Completion Inspection. Provide transmittal letter addressed to the Owner/Architect indicating that the Contractor is providing one (1) set of Red-Line Record Documents.

D. Annotated Adobe *.PDF A-Built Drawings:

The Owner/Architect will provide a full set of Adobe Acrobat *.PDF format As-Built Drawings to the Contractor. The Contractor shall be required to annotate (redline) the *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the
*.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Engineer. The Contractor shall also provide 11”x17” hardcopy laser prints of *.PDF drawings in each O&M Manual.

3.10 SUBSTANTIAL COMPLETION

Complete Final Checkout of system operation, Final Checklist, Cable Test Results, O&M Manuals and Record Documents prior to Substantial Completion. The Contractor's project manager and project senior technician shall be present for the Substantial Completion Inspection.

3.11 OWNER PERSONNEL TRAINING

Owner personnel training shall be provided for the Structured Cabling System. The cost of training shall be included in the cost of the system. Two copies of all manuals and training material shall be supplied to the Owner’s Project Manager at no additional cost.

The Owner's Project Manager shall be notified prior to each training session and may participate in the training at his or her discretion.

All instruction shall be presented in an organized and professional manner by personnel who are thoroughly familiar with the installation and who certified by the manufacturer of the specific system and/or equipment for which they are providing training.

The Structured Cabling System Contractor shall provide documentation of all training (including names of personnel present at each training session) to the Owner at the Final Completion Inspection. The documentation shall be signed-off by the Owner. The documentation shall be three-hole punched and ready for insertion in the O&M manuals.

A. Structured Cabling System Training:

Subsequent to Substantial Completion but prior to Final Completion, the Contractor shall provide on-site training to Owner personnel on the operational use of the Structured Cabling System and all related equipment.

The Structured Cabling System Contractor shall schedule a time to provide not less than one (1) hour of formal training to Owner personnel on the Structured Cabling System. The Structured Cabling System Contractor shall provide an additional two (2) hours of follow-up training on the system when requested by the Owner at any time during the warranty period.

Structured Cabling System training shall include a "walk-through" of the systems to identify and locate closets, panels, and important system components, a discussion of overall system concepts and configuration, specific instruction in labeling and patch cord move/changes, a review of the as-built drawings, a review of the system verification and acceptance documentation, and guidelines for basic trouble-shooting and operation of the Structured Cabling System and all related equipment.

3.12 FINAL COMPLETION

Following completion of punch list items generated by the Owner/Architect following the Substantial Completion Inspection, the Contractor shall notify the Owner/Architect in writing, stating that all punch list items have been completed.

3.13 WARRANTY

The Structured Cabling System Contractor warrants all work performed by him directly and all work performed for him by others for a period of three years. Any work, material or equipment which during the warranty period is, in the opinion of the Owner/Architect or the Owner's Project Manager, defective or inferior and not in accordance with the contract documents, shall be made good at no additional cost to the Owner, including any other work which may have been damaged because of such deficiencies. The Contractor shall be the contact person and the person responsible for coordinating all warranty work for the Owner.

When equipment cannot be repaired at the site, the Contractor shall be completely and solely responsible for the coordination and completion of equipment repairs, including pickup at the project site, transportation and shipping costs to and from the repair site, and reinstallation and reintegration into the system. Equal or better loaner equipment shall be provided and installed by the Contractor any time equipment cannot be repaired at the site, so that the system is maintained in continuous working order as before the equipment failed.

A. Special Warranty – Structured Cabling System:

The Structured Cabling System Contractor shall be fully able to provide the following warranty if requested by the Owner.

All materials, equipment and workmanship incorporated in the work shall be guaranteed by the Structured Cabling System Contractor and the Structured Cabling System Manufacturer for a period of 25 years from the date of Final Completion of the project and Final Acceptance by the Owner. See paragraph 1.4.A Special Warranty - Structured Cabling System for detailed requirements. The Structured Cabling System Contractor shall provide all necessary documentation required by the Structured Cabling System Manufacturer to properly register the system with the manufacturer for warranty purposes. The Structured Cabling System Manufacturer shall issue certificates of warranty signed by a permanent employee of the Structured Cabling System Manufacturer who is authorized by the senior officers of the company to certify the fiber optic, Category 6 and Category 6A cabling systems. Original certificates of warranty shall be provided to the Owner, with copies to the Owner/Architect.

END OF SECTION 270000

SECTION 27 80 00 – IP SECURITY CAMERA SYSTEM

1.0 PART 1 - GENERAL

1.1 SCOPE

A. This specification delineates the requirements for a complete IP Camera Security System as specified herein and as indicated on the drawings.

B. The IP Security Camera System Integrator shall also be the Access Control System Contractor. See Section 28 10 00 – ACCESS CONTROL & INTRUSION ALARM SYSTEM.

C. The scope of work is to provide a complete and warranted system ready for full operation in accordance with the contract documents and additional direction provided by the Owner to the IP Security Camera System Integrator. The installation shall include all accessories and appurtenances required to provide a complete and fully operational system. Any materials not specifically mentioned in these specifications or not shown on the drawings but required for a complete and finished installation shall be furnished and installed at no additional cost to the Owner.

D. Refer to the IP Security Camera System drawings, electrical drawings, architectural drawings and structured cabling system drawings for additional information regarding the scope of related work for the General Contractor and each subcontractor. Coordinate all work closely with the Owner's Project Manager, General Contractor/Construction Manager, Electrical Contractor, and Structured Cabling System Contractor.

1.2 STRUCTURED CABLING SYSTEM CONTRACTOR

See Section 270000 - Communications Structured Cabling System.

A. The Structured Cabling System Contractor (SCSC) shall provide, terminate, label and test the Category 6 horizontal cabling serving the security cameras. The SCSC shall provide slack cable length at each camera as directed by the IP Security Camera System Integrator. The SCSC shall also provide horizontal patch panels and patch cables in the communications closet, along with labeling and all other associated work.

B. The SCSC shall closely coordinate all work with the General Contractor, IP Security Camera System Integrator, and Electrical Contractor.

1.3 IP SECURITY CAMERA SYSTEM INTEGRATOR

A. The General Contractor shall include an Allowance for all work by the IP Security Camera System Integrator in the Base Bid. The IP Security Camera System Integrator selected by and currently under multi-year contract with the Owner shall provide work as specifically indicated in this specification section, all work as described on the drawings and as described in the IP Security Camera System Integrator Allowance cost and scope of work statement. The Allowance cost and scope of work statement will be issued in an Addendum prior to bids. The General Contractor shall include the cost of the allowance in the Base Bid, and the IP Security Camera System Integrator shall be a direct subcontractor to the General Contractor- no exceptions. See drawings for additional information.

B. The IP Security Camera System Integrator shall be Glaze Communications. Contact Doug Taylor at dtaylor@gcsgulfcoast.com.

C. The Owner has standardized on Avigilon for a multi-site web-based Enterprise Video Management System (VMS). The IP Security Camera System for this project shall be fully integrated into the Avigilon system as required for a complete and fully functional system and as directed by the Owner.

D. The IP Security Camera System Integrator shall be responsible for coordinating final security camera locations to include mounting height for optimum camera views.

E. The IP Security Camera System Integrator shall provide all security cameras and security camera mounts, along with full integration of all security cameras into the Owner's Avigilon Enterprise Video Management System (VMS). The IP Security Camera System Integrator shall provide a Network Video Recorder (NVR) with sufficient high temp high reliability surveillance grade storage for 30 days retention of all camera views with cameras set at the highest available resolution and with the frames per second rate standard for the Owner (minimum of 15 FPS). The IP Security Camera System Integrator shall provide all CCTV Monitors indicated on the drawings along with decoders for each monitor.

F. The IP Security Camera System Integrator shall be fully certified by and shall be an authorized dealer for the Avigilon VMS and all security camera manufacturers listed in the drawings.

G. The IP Security Camera System Integrator shall closely coordinate all work with the General Architect, Contractor, Structured Cabling System Contractor, and Electrical Contractor.

1.4 RELATED REQUIREMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

Electrical Specification Sections regarding conduit apply to work under this section, with the additions and modifications specified herein and on the drawings. The special requirements indicated on the drawings and in this specification section for IP Security System conduit shall take precedence over any requirements specified in Electrical Specification Sections.

All conduit and related work shall be provided by the project electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents. See drawings for conduit requirements.

1.5 EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

Prior to providing a proposal for this work, the Contractor shall examine the drawings, specifications, and other contract documents and shall visit the project site to become thoroughly regarding any and all conditions and requirements that may in any manner affect the work to be performed under the contract. No allowances shall be made because of lack of knowledge of these conditions.

The Contractor shall have total system responsibility to assure a fully operational system. Any additional labor and components required for the installation of complete operating systems but not specifically required by the bid documents shall be provided and the cost borne by the Contractor.

The Contractor shall remain the sole owner of the system and all the system components provided under this contract and is responsible for all risk of loss or damage of the system for the entire contract period up to and including the date and time of Final Acceptance by the Engineer and the Owner's Project Manager. After the date of Final Acceptance, the Owner

shall assume full ownership of the system with all components, and the warranty period shall commence.

1.6 The contractor shall procure all IP Security System equipment from a factory authorized reseller in the geographical area of the project for continued support.

1.7 QUALITY ASSURANCE

Materials shall be new and shall be the best of their respective kinds. All work shall be accomplished in a workmanlike manner in keeping with the best practices and highest standards of the IP Security Camera System industry.

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until final acceptance by the Engineer and the Owner.

1.8 CODES AND STANDARDS

All work done under this contract shall be performed in accordance with the most recent issue of the following codes and standards. Where there is a perceived conflict between a standard and the contract documents, the Contractor shall perform the work as directed by the Engineer. Where no specific method or form of construction is called for in the Contract Documents, the Contractor shall comply with code requirements when carrying out such work.

1.8.1 Codes:

a. Florida Building Code
b. National Electrical Code (NFPA 70)
c. National Electrical Safety Code (NESC)

1.8.2 Standards: All electrical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments:

a. American National Standard Institutes (ANSI)
b. Institute of Electrical and Electronics Engineers (IEEE).
c. National Electrical Manufacturer's Associations (NEMA).
d. National Fire Protection Association (NFPA).
e. Occupational Safety and Health Act (OSHA).
f. Underwriter's Laboratories, Inc. (UL).
g. Electronic Industry Association (EIA).
h. Telecommunication Industry Association (TIA).
i. American Society of Industrial Security (ASIS)

1.9 SUBMITTALS

1.9.1 Submit three copies of the manufacturer’s catalog data and pre-installation drawings to the Engineer for approval prior to commencing work or ordering materials. Receive approval of the Engineer in writing for each item of submittals prior to commencing work.

1.9.2 Manufacturer's Catalog Data: Submit the producer's standard descriptive data sheets for each type of product being provided. Provide products in accordance with the drawings. Provide complete data sheets bearing the printed logo or trademark of the manufacturer. Mark each

copy of the data sheets for the specific product being provided with an identifying mark, arrow, or highlighting. Submittals without such identifying marks shall be rejected without comment for resubmittal. The following are typical items that shall be submitted:

a. Category 6 Cabling, each type (submit under Section 270000)
b. Category 6 Cable Connectors (submit under Section 270000)
c. Cameras, each type, with all accessories including enclosures
d. All camera mounting housings, brackets, pendants and other accessories
e. Camera recording video storage appliance as required for new cameras based on resolution and recording rate. Recording rate shall be as directed by the Owner.
f. Fire-stopping, each type (each UL listed Assembly) (submit under Section 270000)
g. All conduit and pull boxes (submit under Electrical division)
h. All other materials and equipment indicated on the drawings to be furnished under this section, whether specifically listed here or not.
i. All other information indicated on the contract drawings, and all additional information required by the Engineer.

1.10 CONTRACTOR'S RECORD DOCUMENTS

The Contractor shall maintain a full set of contract documents at the job site at all times, consisting of specifications, drawings, addenda, pre-installation submittals, change orders, and engineering directives. The record documents shall be updated by the Contractor, in red pen and on a daily basis, to show the following:

a. Final location of all Cameras.
b. Final conduit routing.
c. Final location of all pull boxes and access doors.
d. Any changes to the work authorized by the Architect/Engineer.
e. Any other pertinent information that may be of value to the Owner in operating and maintaining the system.

The Contractor's record documents shall be available for viewing by the Engineer or the Owner at the site at any time and shall be presented and reviewed by the Contractor at each construction progress meeting. The record documents shall be clearly marked "Record Set", shall be kept in a protected location, and shall not be used for general construction purposes. The record documents shall be provided to the Engineer at the close of the project.

The Engineer will provide a full set of Adobe Acrobat *.PDF format drawings to the Contractor. The Contractor shall be required to annotate (redline) the Adobe Acrobat *.PDF format drawings using Adobe Acrobat to reflect all information recorded in the field. The Contractor shall provide a copy of the Adobe Acrobat *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Engineer. The Contractor shall also provide 11”x17” laser prints of Adobe Acrobat *.PDF drawings in each O&M Manual.

2.0 PART 2 - PRODUCTS

2.1 General

All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects.

All products shall be the manufacturer and model or part number specified. Bid shall be for new equipment only. Newly manufactured (containing used or rebuilt parts), remanufactured, rebuilt, reconditioned, newly remanufactured, used, shopworn, demonstrator or prototype

equipment is not acceptable and will be rejected. If required by the Engineer, the Contractor shall provide a written certification from the manufacturer referencing the serial number each item of equipment and stating that the equipment is new.

All materials, equipment and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70.

All like items of material or equipment shall be the same product of the same manufacturer.

All materials and equipment shall be a standard catalogued product of a manufacturer regularly engaged in the manufacture of similar products.

Where a model or part number is indicated in error for any reason, the Contractor shall verify the intent of the Engineer prior to providing a bid proposal, and shall provide the product intended by the Engineer. Where a manufacturer has updated or improved a product subsequent to issuance of the bid documents by the Engineer, the Contractor shall provide the updated or improved product at no additional cost to the Owner.

2.2 Product Specifications:

To ensure a uniform basis for bidding, and to standardize the Owner’s facilities, base all bids on the particular systems, equipment and materials specified herein and indicated on the drawings which are based on Owner standards.

See drawings for all product requirements not indicated in these specifications. The Contractor shall be responsible for providing and installing all components indicated in these specifications and on the drawings, unless specifically indicated to be provided by others.

3.0 PART 3 - EXECUTION

General: The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written recommendations, and the contract drawings and these specifications.

All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects. Workmanship shall be of the highest grade in accordance with modern practice.

The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration and repair.

3.1 See Section 270000 and drawings for cabling, conduit, firestopping, cable testing, and other installation requirements. All cabling for security cameras shall be installed in continuous homerun conduit. Where indicated for cameras located on the non-CER side of the building provide burial grade cable installed in underground conduit.

The SCSC shall test each cable as indicated in Section 270000. Document results of testing and submit to Engineer for review and approval. The test log shall include camera identifier, the test date, the initials of the technician who tested the cable, and the test results.

3.2 CAMERA INSTALLATION

3.2.1 Camera locations and heights indicated on the drawings are approximate and are provided for purposes of bidding.

The General Contractor shall schedule meetings at the site prior to commencement of any conduit installation activities by the Electrical Contractor and any cable installation activities by the SCSC and additionally as construction proceeds to coordinate the exact location and coverage area of each camera prior to installation. The meetings shall include the General Contractor, the Owner's Project Manager and/or his designee, the SCSC, the Electrical Contractor, and the IP Security Camera System Integrator. Final camera locations may be placed up to 10 feet away from locations shown without additional cost to the Owner. Particular attention shall be given to coordination of camera locations relative to obstructions including but not limited to exterior covered walkways, entrance canopies, gutter downspouts, and other camera views. The General Contractor shall be responsible for providing information to the contractors and IP Security Camera System Integrator concerning obstructions which may not be fully built at the time any camera location is determined if that obstruction will negatively impact that camera's full field of view.

The IP Security System Integrator shall install the cameras in accordance with the manufacturer's printed installation instructions and the mounting requirements indicated on the drawings, except that final camera locations shall be determined as indicated above.

After final camera locations are determined, the cameras are mounted and the cabling installed and tested by the SCSC, the IP Security Camera System Integrator shall test the operation of each camera and shall set final camera viewing angles, fields of view, lens settings, compression settings and other camera settings with the Owner's Project Manager or his designee. The IP Security Camera System Integrator shall notify the SCSC through the GC in writing if any cabling deficiencies are found, and the SCSC shall promptly correct those deficiencies.

3.3 HEADEND EQUIPMENT INSTALLATION AND PROGRAMMING

3.3.1 Headend equipment installation, setup and programming shall be provided by the IP Security Camera System Integrator. Cameras shall be recorded at the highest resolution offered for each camera type and the frame rate directed by the Owner.

3.4 SYSTEM VERIFICATION AND ACCEPTANCE

3.4.1 System Testing: Proof of performance of the IP Security Camera System to include a full system operational test shall be conducted in the presence of the Owner's Project Manager by the IP Security Camera System Integrator.

3.5 CHECKOUT

3.5.1 Subsequent to testing and verification and prior to the first day of normal operation following start-up, the IP Security Camera System Integrator shall be responsible for checking out the system to verify that it is operating properly and performing in compliance with the equipment manufacturer's specifications and the specifications. The checkout shall include a System Inspection Checklist to fully document checkout.

3.6 CLEANUP

3.6.1 Upon completion of the work each day the contractor shall reconnect any utilities, equipment, or appliances removed in the course of work and replace all furniture, etc., moved for the performance of the work. Debris and rubbish caused by the work shall be removed and the premises left clean each day. Vacuum clean all interior areas each day.

3.7 SUBSTANTIAL COMPLETION

3.7.1 The Electrical Contractor shall complete the installation of the IP Security Camera conduit and the Structured Cabling System Contractor shall complete the installation of the IP Security Camera cabling not less than 30 days prior to the scheduled date for Substantial Completion to allow sufficient time for the IP Security Camera System Integrator to complete all work indicated to be provided under the IP Security Camera System Integrator Allowance and all work indicated in this specification to be provided by the integrator, to include User Training, such that the IP Security Camera system shall be fully operational and ready for use by the Owner on the date of Substantial Completion.

3.8 FINAL COMPLETION

3.8.1 Following completion of the Substantial Completion punch list items and the initial performance period, the contractor shall notify the Engineer. The Engineer will conduct a final completion inspection. Upon determining that all punch list items have been satisfactorily completed, the Engineer will declare the work finally complete. For the purposes of this contract the terms Final Completion, Final Acceptance, and Final System Acceptance are synonymous.

3.9 DOCUMENTATION

3.9.1 Red-Line Record Documents:

Refer to paragraph "CONTRACTOR'S RECORD DOCUMENTS". Provide Record Documents, updated in red pen, to accurately reflect the finished installation.

Submit Red-Line Record Documents over to the Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Engineer indicating that the Contractor is providing one (1) set of Red-Line Record Documents.

3.9.2 Annotated Adobe *.PDF A-Built Drawings:

The Engineer will provide a full set of Adobe Acrobat *.PDF format As-Built Drawings to the Contractor. The Contractor shall be required to annotate (redline) the *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Engineer. The Contractor shall also provide 11”x17” hardcopy laser prints of *.PDF drawings in each O&M Manual.

3.9.3 O & M Manuals: The contractor shall provide operating and maintenance manuals covering all equipment and materials furnished under this contract. The O & M manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the System. The information shall include detailed documentation equipment configuration. A complete recommended spare parts inventory list shall be included with the lead time and expected frequency of use for each part clearly identified.

A quantity of three (3) 8-1/2" x 11" loose leaf 3-ring binders with clear vinyl overlay designed to receive identification inserts shall be provided. The manuals shall contain the following sections:

a. Cut sheets for all equipment.
b. Installation instructions.
c. Operating and maintenance instructions.
d. Recommended spare parts inventory list.

e. User's Guides and technical reference guides.
f. Copy of warranty.

Provide a list with name, address, contact person, phone number, and fax number for two separate contacts with name and telephone number for warranty service and the manufacturer of each item of equipment with telephone number and sources of supply for parts.

3.10 USER TRAINING

Subsequent to Substantial Completion but prior to Final Completion, the IP Security Camera System Integrator shall provide on-site training to Owner personnel on the operational use of the IP Security Camera System and the all related equipment.

The Access Control System Contractor shall schedule a time to provide not less than eight (8) hours of formal training to Owner personnel on the Access Control System, divided into two four (4) hour sessions, one prior to building occupancy and the second following building occupancy at a time directed by the Owner. See drawings.

IP Security Camera System training shall include a "walk-through" of the systems to identify and locate closets, panels, and important system components, a discussion of overall system concepts and configuration, specific instruction in labeling, a review of the as-built drawings, a review of the system verification and acceptance documentation, guidelines for basic trouble-shooting and detailed instructions in the operation of all aspects of the Electronic the IP Security Camera System and all related equipment.

3.11 WARRANTY

All equipment including material used in the installation thereof shall be warranted for THREE YEARS by the Contractor against mechanical, electrical, and workmanship defects. In the event defects become evident within the warranty period, the Contractor shall repair or replace the defective parts and materials at no additional cost to the Owner. The warranty period shall start with the date of final acceptance. The warranty shall apply to all equipment provided under the provisions of this contract regardless of the location. Warranties submitted with bids, either appearing separately or included in pre-printed literature and price lists, shall not be acceptable and provisions herein take precedence.

The SCSC is not responsible for warranty of equipment and services indicated to be provided by the IP Security Camera System Integrator. The IP Security Camera System Integrator is not responsible for warranty of cabling indicated to be provided by the SCSC.

END OF SECTION 27 80 00

SECTION 28 10 00 – ACCESS CONTROL & INTRUSION ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This specification delineates the requirements for a complete Electronic Access Control with integrated Intrusion Alarm System as specified herein and as indicated on the drawings.

B. The Access Control System Contractor shall also be the IP Security Camera System Integrator. See Section 27 80 00 – IP SECURITY CAMERA SYSTEM.

C. The scope of work is to provide a complete and warranted system ready for full operation in accordance with the contract documents and additional direction provided by the Owner to the Access Control System Contractor. The installation shall include all accessories and appurtenances required to provide a complete and fully operational system. Any materials not specifically mentioned in these specifications or not shown on the drawings but required for a complete and finished installation shall be furnished and installed at no additional cost to the Owner.

D. Refer to the access control and intrusion alarm system drawings, electrical drawings, architectural drawings and door hardware specifications for additional information regarding the scope of related work for the General Contractor and each subcontractor. Coordinate all work closely with the Owner's Project Manager, General Contractor/Construction Manager, Electrical Contractor, Structured Cabling System Contractor, and door hardware provider.

1.2 ACCESS CONTROL SYSTEM CONTRACTOR

A. The General Contractor shall include an Allowance for all work by the Access Control System Contractor in the Base Bid. The Access Control System Contractor selected by and currently under multi-year contract with the Owner shall provide all work as specifically indicated in this specification section, all work as described on the drawings and in the Access Control System Contractor Allowance cost and scope of work statement. The Allowance cost and scope of work statement will be issued in an Addendum prior to bids. The General Contractor shall include the cost of the allowance in his Base Bid, and the Access Control System Contractor shall be a direct subcontractor to the General Contractor – no exceptions. See drawings for additional information.

B. The Access Control System Contractor shall be Glaze Communications. Contact Doug Taylor at dtaylor@gcsgulfcoast.com.

C. The Owner has standardized on Avigilon for a multi-site web-based access control system management, monitoring and control system. The Access Control System for this project shall be fully integrated into the Avigilon system as required for a complete and fully functional system and as directed by the Owner.

D. The Access Control System Contractor shall provide all setup, configuration and programming of the Avigilon system to fully incorporate all new access control and intrusion alarm systems installed under this project. See drawings for additional requirements.

E. The Access Control System Contractor shall be thoroughly knowledgeable in the installation and setup of all access control system materials and equipment required by the bid documents

and as required for a complete and fully operational system.

F. The Access Control System Contractor shall provide all wiring for each sub-system, except that Category 6 cabling to the Access Control System for emergency notification and Category 6 cabling to Access Control System Panels for Ethernet Network interfaces shall be provided by the Structured Cabling System Contractor under Section 27 00 00.

G. The Access Control System Contractor shall include but not be limited to the following sub-systems and all related work:

Access Control System.
Intrusion Alarm System (using door position switches and request to exit switches factory provided in electrified locksets and exit devices) and integrated into the access control system.
Remote Notification Interfaces.
All other work indicated on the drawings and all other work required for a complete Access Control and Intrusion Alarm System with lockdown.

H. The Access Control System Contractor shall be responsible for providing a final detailed design for each sub-system incorporating the systems indicated schematically on the drawings with all additional components and features required for complete systems based on Owner standards and specific direction for this project.

I. The Access Control System Contractor project manager shall periodically visit the site and inspect the work in progress. Project manager site visits shall be made not less than once per month when the job is in active progress. The project manager shall prepare a field report for each site visit for submission to the Owner. The project manager shall sign off on all system test results.

1.3 EQUIPMENT PROVIDER

The contractor shall procure all Access Control System equipment from a factory authorized reseller in the geographical area of the project for continued support.

1.4 RELATED REQUIREMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

Electrical Specification Sections regarding conduit apply to work under this section, with the additions and modifications specified herein and on the drawings. The special requirements indicated on the drawings and in this specification section for Access Control System conduit shall take precedence over any requirements specified in Electrical Specification Sections.

All conduit and related work shall be provided by the project electrical contractor using tradesmen who are skilled and experienced in the types of conduit installations indicated in the bid documents. See drawings for conduit requirements.

Refer to Section 27 00 00 Communications Structured Cabling System for related work by the Communications Structured Cabling System Contractor who shall provide a Category 6 connection to the Access Control System for emergency notification and a Category 6 Ethernet network connection (two Category 6 cables) to each Access Control System panel.

1.5 EXAMINATION OF SITES AND TOTAL SYSTEM RESPONSIBILITY

Prior to providing a proposal for this work, each bidder shall examine the drawings,

specifications, and other contract documents to inform himself/herself thoroughly regarding any and all conditions and requirements that may in any manner affect the work to be performed under the contract.

The Contractor shall remain the sole owner of the system and all the system components provided under this contract and is responsible for all risk of loss or damage of the system for the entire contract period up to and including the date and time of Final Acceptance by the Engineer and the Owner's Project Manager. After the date of Final Acceptance, the Owner shall assume full ownership of the system with all components, and the warranty period shall commence.

1.6 QUALITY ASSURANCE

Materials shall be new and shall be the best of their respective kinds. All work shall be accomplished in a workmanlike manner in keeping with the best practices and highest standards of the Electronic Access Control & Panic Alarm System industry.

Protect materials and equipment from physical or environmental damage during shipping, storage and installation. Equipment and materials shall be received at the site in new condition and shall be maintained in new condition throughout the installation process. Damaged or deteriorated equipment and materials will not be acceptable. The Contractor shall be responsible for the safety and condition of all materials and equipment, whether stored or installed, until final acceptance by the Engineer and the Owner.

1.7 CODES AND STANDARDS

All work done under this contract shall be performed in accordance with the most recent issue of the following codes and standards. Where there is a perceived conflict between a standard and the contract documents, the Contractor shall perform the work as directed by the Engineer. Where no specific method or form of construction is called for in the Contract Documents, the Contractor shall comply with code requirements when carrying out such work.

A. Codes:

a. International Building Code
b. National Electrical Code (NFPA 70)
c. National Electrical Safety Code (NESC)

B. Standards: All electrical materials, installation and systems shall meet the requirements of the following standards, including the latest addenda and amendments:

a. American National Standard Institutes (ANSI)
b. Institute of Electrical and Electronics Engineers (IEEE).
c. National Electrical Manufacturer's Associations (NEMA).
d. National Fire Protection Association (NFPA).
e. Occupational Safety and Health Act (OSHA).
f. Underwriter's Laboratories, Inc. (UL).
g. Electronic Industry Association (EIA).
h. Telecommunication Industry Association (TIA).
i. American Society of Industrial Security (ASIS)

1.8 SUBMITTALS

A. Submit three copies of the manufacturer's catalog data and pre-installation drawings to the Engineer for approval prior to commencing work or ordering materials. Receive approval of the Engineer in writing for each item of submittals prior to commencing work.

B. Manufacturer's Catalog Data: Submit the producer's standard descriptive data sheets for each type of product being provided. Provide products in accordance with the drawings. Provide complete data sheets bearing the printed logo or trademark of the manufacturer. Mark each copy of the data sheets for the specific product being provided with an identifying mark, arrow, or highlighting. Submittals without such identifying marks shall be rejected without comment for resubmittal.

Submit the following items and all other items required for a complete system:

a. Cabling, each type
b. Cabling connectors
c. Card Reader, each type, with all accessories including enclosures
d. All card reader mounting accessories
e. Door Position Switches
f. Access Control and Intrusion Alarm System panels
g. Access Control System and Intrusion Alarm power supplies
h. Fire-stopping, each type (each UL listed Assembly)
i. All other materials and equipment indicated on the drawings to be furnished under this section, whether specifically listed here or not.
j. All other materials and equipment required for complete and fully functional system in accordance with direction from the Owner, whether indicated elsewhere or not.
k. All other information indicated on the contract drawings, and all additional information required by the Engineer.

1.9 CONTRACTOR'S RECORD DOCUMENTS

The Access Control System Contractor shall maintain a full set of contract documents at the job site at all times, consisting of specifications, drawings, addenda, pre-installation submittals, change orders, and engineering directives. The record documents shall be updated by the Contractor, in red pen and on a daily basis, to show the following:

a. Final location of all Card Readers.
b. Final locations of all access control system panels and power supplies.
c. Final location of all other system components.
d. Any changes to the work authorized by the Architect/Engineer.
e. Any other pertinent information that may be of value to the Owner in operating and maintaining the system.

The Contractor's record documents shall be available for viewing by the Engineer or the Owner at the site at any time and shall be presented and reviewed by the Contractor at each construction progress meeting. The record documents shall be clearly marked "Record Set", shall be kept in a protected location, and shall not be used for general construction purposes. The record documents shall be provided to the Engineer at the close of the project.

The Engineer will provide a full set of Adobe Acrobat *.PDF format drawings to the Contractor. The Contractor shall be required to annotate (redline) the Adobe Acrobat *.PDF format drawings using Adobe Acrobat to reflect all information recorded in the field. The Contractor shall provide a copy of the Adobe Acrobat *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Engineer. The Contractor shall also provide 11”x17” laser prints of Adobe Acrobat *.PDF drawings in each O&M Manual. Electronic files of the Engineer’s AutoCAD floor plan drawings will be provided to the Contractor upon request.

PART 2 - PRODUCTS

2.1 GENERAL

All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects.

All products shall be the manufacturer and model or part number specified. Bid shall be for new equipment only. Newly manufactured (containing used or rebuilt parts), remanufactured, rebuilt, reconditioned, newly remanufactured, used, shopworn, demonstrator or prototype equipment is not acceptable and will be rejected. If required by the Engineer, the Contractor shall provide a written certification from the manufacturer referencing the serial number each item of equipment and stating that the equipment is new.

All materials, equipment and devices shall, as a minimum, meet the requirements of UL where UL standards are established for those items, and the requirements of NFPA 70.

All like items of material or equipment shall be the same product of the same manufacturer.

All materials and equipment shall be a standard catalogued product of a manufacturer regularly engaged in the manufacture of similar products.

Where a model or part number is indicated in error for any reason, the Contractor shall verify the intent of the Engineer prior to providing a bid proposal and shall provide the product intended by the Engineer. Where a manufacturer has updated or improved a product subsequent to issuance of the bid documents by the Engineer, the Contractor shall provide the updated or improved product at no additional cost to the Owner.

2.2 PRODUCT SPECIFICATIONS

To ensure a uniform basis for bidding, and to standardize the Owner’s facilities, base all bids on the particular systems, equipment and materials specified.

See drawings for all product requirements not indicated in these specifications. The Structured Cabling Contractor shall be responsible for providing and installing all components indicated in these specifications and on the drawings, unless specifically indicated to be provided by others.

PART 3 - EXECUTION

3.1 GENERAL

The installation shall be in strict accordance with all applicable codes and standards, the respective manufacturer's written recommendations, and the contract drawings and these specifications.

All materials, equipment, and devices shall be new and unused, of current manufacture and of the highest grade, free from defects. Workmanship shall be of the highest grade in accordance with modern practice.

The installed system shall be neat, clean, and well organized in appearance. Provide working clearances for normal system operation, reconfiguration and repair.

The Access Control System Contractor shall test each cable as required by NEC and all requirements of the cable manufacturer and the manufacturer of connected equipment for operational and warranty compliance. Document results of testing and submit to Engineer for review and approval. The test log shall include the system component identifier, the test date, the initials of the technician who tested the cable, and the test results.

All equipment mounting heights and locations shall be in accordance with the Americans with Disabilities Act (ADA). Coordinate with the Architect.

All wiring shall be terminated on terminal blocks – each wire shall be terminated using crimp on ring style lug connectors. Wire nuts or B-style crimp on connectors are not acceptable.

Run a single jacketed cable containing all necessary individually insulated cables plus 25% minimum spare of each conductor size to operate the access control system with all related functions at each secure door. The cable shall be continuous with no splices from the serving CER or CC to the point of connection at the secure door served.

3.1.1 Conduit Installation:

See drawings for conduit requirements.

3.1.2 Cabling Installation:

Access Control System cabling shall be run continuously in conduit without exception.

Do not pull cables in conduits until plastic insulating bushings have been installed. Cables installed in conduits without plastic insulating bushings shall be removed and replaced with new cables. Rack conduits and run together wherever possible.

The Contractor, in providing a bid for the system in accordance with the contract documents, agrees to install all cabling in the conduit and wireway paths indicated in the contract documents, or to provide larger conduit and wireway paths as he deems necessary, at no additional cost to the Owner. The Contractor shall be fully responsible for any and all damage to cabling that may occur during the installation and shall replace any damaged cabling with new cabling of the type specified for the application.

Firestop all conduit penetrations of all walls that extend to the underside of the roof deck above. Firestop all conduit penetrations of all walls that do not extend to the underside of the roof deck above but are indicated as fire rated on the drawings. Accomplish firestopping using UL classified systems with fire rating equal to or greater than the fire rating of the floor or wall assembly penetrated. Firestop systems shall be 3M, Nelson or Engineer approved equal. Install in strict accordance with the manufacturer's printed instructions and the conditions of the UL approval for each firestop system used.

All cable penetrations of walls that do not extend to the underside of the roof deck above shall be sealed smoketight and acoustically with smoke-sound caulking UL listed for the purpose such as USG Firecode, STI Smoke ‘N’ Sound, or Hilti CP.

3.2 CARD READER LOCATIONS

Card Reader locations indicated on the drawings are approximate – see “Card Reader Location Note” on the drawings.

The General Contractor shall schedule meetings at the site prior to commencement of any installation activities by the Access Control System Contractor and the system rough-in provider

and additionally as construction proceeds to coordinate the exact location of each card reader prior to installation. The meetings shall include the General Contractor, the Owner's Project Manager, the Access Control System Contractor, and the Electrical Contractor. Final card reader locations may be placed up to 10 feet away from locations shown without additional cost to the Owner. Particular attention shall be given to coordination of card reader locations relative to clear visibility, easy user access, and open direct path to controlled door after unlock.

The Access Control System Contractor shall install the card readers in accordance with the manufacturer's printed installation instructions and the mounting requirements indicated on the drawings, except that final reader locations shall be determined as indicated above. All card readers shall be flush mounted.

After final card reader locations are determined and the readers are mounted and wired the Access Control System Contractor shall test the operation of each reader with the Owner's Project Manager and IT personnel.

3.3 SYSTEM SETUP AND PROGRAMMING

All required headend equipment installation, setup and programming shall be provided by the Access Control System Contractor in accordance with established Owner standards or as directed by the Owner.

The Access Control System Contractor shall also complete all work related required for the full application of the Owner standard Avigilon Access Control Management System to the Access Control Systems for this project as directed by and to the satisfaction of the Owner's Project Manager, Security Staff and IT Staff.

In general use all setup features provided by the manufacturer to provide the best system operation under all conditions of use. Describe to the Owner all available features of the system and provide setup as directed by the Owner and for the best overall operation and performance of the system as a whole for the intended purpose.

Assign each secure door a schedule and assign door types. Setup time schedules and operating modes for each unique secure door type. Coordinate operating modes for each secure door type at different times of the day, week and year in detail with the Owner. Coordinate regularly scheduled events as well special events. Setup and program system accordingly for access to the facility by use of card readers using Owner issued employee proximity cards. Assign credentials provided by the Owner and provide all related information entry into software if so directed by the Owner.

Setup system user interface stations selected by the Owner for through the facility LAN and Web. Setup user/host authentication, user access and user priorities.

Setup Intrusion Alarm System for arm/disarm as indicated on the drawings and for alarm notification as directed by Owner to include all methods and recipients of local and remote notification as directed by the Owner.

Coordinate all network interfaces with the Owner's IT personnel. Contact the Owner's project manager to schedule meetings with required personnel.

3.4 SYSTEM VERIFICATION AND OWNER'S ACCEPTANCE TEST

Proof of performance of the Access Control System to include a full system operational test shall be conducted in the presence of the Owner's Project Manager and Owner personnel. As part of proof of performance demonstrate system operation to Owner's personnel.

The Contractor shall conduct a final inspection and pretest all equipment and system features required for project. Contractor shall correct any deficiencies discovered as the result of the inspection and pre-test.

The Contractor shall submit a request for Owner Acceptance Test in writing to the Owner's Project Manager, no less than fourteen days prior to the requested test date. The request for Acceptance Test shall be accompanied by a certification from Contractor that all work is complete and has been pre-tested, and that all corrections have been made.

During Acceptance Test, Contractor shall demonstrate all equipment and system features to the Owner. The Contractor shall remove covers, open wiring connections, operate equipment, and perform other reasonable work as requested.

Any portions of the work found to be deficient or not in compliance with the Drawings and Specifications will be rejected. The Contractor shall promptly correct all deficiencies and submit a request in writing to Owner's Project Manager for a follow-up Acceptance Test.

3.5 CHECKOUT

Subsequent to testing and verification and prior to the first day of normal operation following start-up, the contractor shall be responsible for checking out the system to verify that it is operating properly and performing in compliance with the equipment manufacturer's specifications and the specifications. The checkout shall include a System Inspection Checklist to fully document checkout.

3.6 SUBSTANTIAL COMPLETION

The Access Control System Contractor shall complete the installation of the Access Control System prior to the scheduled date for Substantial Completion to allow sufficient time for Owner Training and final system setup such that the Access Control System shall be fully operational and ready for use on the date of Substantial Completion.

3.7 FINAL COMPLETION

Following completion of the Substantial Completion punch list items and the initial performance period, the contractor shall notify the Engineer. The Engineer will conduct a final completion inspection. Upon determining that all punch list items have been satisfactorily completed, the Engineer will declare the project finally complete. For the purposes of this contract the terms Final Completion, Final Acceptance, and Final System Acceptance are synonymous.

3.8 DOCUMENTATION

A. Red-Line Record Documents:

Refer to paragraph "CONTRACTOR'S RECORD DOCUMENTS". Provide Record Documents, updated in red pen, to accurately reflect the finished installation.

Submit Red-Line Record Documents over to the Engineer at the Substantial Completion Inspection. Provide transmittal letter addressed to the Engineer indicating that the Contractor is providing one (1) set of Red-Line Record Documents.

B. Annotated Adobe *.PDF A-Built Drawings:

The Engineer will provide a full set of Adobe Acrobat *.PDF format As-Built Drawings to the Contractor. The Contractor shall be required to annotate (redline) the *.PDF format drawings using Adobe Acrobat to reflect all changes recorded in the field as required by the paragraph "CONTRACTOR'S RECORD DOCUMENTS". The Contractor shall provide a copy of the *.PDF files on CD with each set of O&M Manuals and shall provide an additional copy on CD to the Engineer. The Contractor shall also provide 11”x17” hardcopy laser prints of *.PDF drawings in each O&M Manual.

C. O & M Manuals:
The contractor shall provide operating and maintenance manuals covering all equipment and materials furnished under this contract. The O & M manuals shall contain all information necessary for the operation, maintenance, replacement, installation, and parts procurement for the System. The information shall include detailed documentation equipment configuration. A complete recommended spare parts inventory list shall be included with the lead time and expected frequency of use for each part clearly identified.

A quantity of three (3) 8-1/2" x 11" loose leaf 3-ring binders with clear vinyl overlay designed to receive identification inserts shall be provided. The manuals shall contain the following sections:

a. Cut sheets for all equipment.
b. Detailed wiring diagrams and panel drawings
b. Installation instructions.
c. Operating and maintenance instructions.
d. Recommended spare parts inventory list.
e. User's Guides and technical reference guides.
f. Copy of one year warranty.

Provide a list with name, address, contact person, phone number, and fax number for two separate contacts with name and telephone number for warranty service and the manufacturer of each item of equipment with telephone number and sources of supply for parts.

3.9 USER TRAINING

Subsequent to Substantial Completion but prior to Final Completion, the Access Control System Contractor shall provide on-site training to Owner personnel on the operational use of the Electronic Access Control & Intrusion Alarm System and the all related equipment.

The Access Control System Contractor shall schedule a time to provide not less than eight (8) hours of formal training to Owner personnel on the Access Control System, divided into two four (4) hour sessions, one prior to building occupancy and the second following building occupancy at a time directed by the Owner. See drawings.

Access Control System training shall include a "walk-through" of the systems to identify and locate closets, panels, and important system components, a discussion of overall system concepts and configuration, specific instruction in labeling, a review of the as-built drawings, a review of the system verification and acceptance documentation, guidelines for basic trouble-shooting and detailed instructions in the operation of all aspects of the Electronic Access Control & Intrusion Alarm System and all related equipment.

3.10 WARRANTY

All equipment including material used in the installation thereof shall be warranted for one year by the Access Control System Contractor against mechanical, electrical, and workmanship defects. In the event defects become evident within the warranty period, the Contractor shall

repair or replace the defective parts and materials at no additional cost to the Owner. The warranty period shall start with the date of final acceptance. The warranty shall apply to all equipment provided under the provisions of this contract regardless of the location. Warranties submitted with bids, either appearing separately or included in pre-printed literature and price lists, shall not be acceptable and provisions herein take precedence.

END OF SECTION 28 10 00

SECTION 284621.11 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Addressable fire-alarm system.
2. Fire-alarm control unit (FACU).
3. Manual fire-alarm boxes.
4. System smoke detectors.
5. Duct smoke detectors.
6. Carbon monoxide detectors.
7. Multicriteria and multisensor fire detectors.
8. Fire-alarm notification appliances.
9. Fire-alarm remote annunciators.
10. Fire-alarm addressable interface devices.
11. Digital alarm communicator transmitters (DACTs).

1.2 Section 260519 "Low-Voltage Electrical Power Conductors and Cables" or DEFINITIONS

A. DACT: Digital alarm communicator transmitter.

B. FACU: Fire-alarm control unit.

C. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

1. Control Voltage: Listed and labeled for use in remote-control, signaling, and power-limited circuits supplied by a Class 2 or Class 3 power supply having rated output not greater than 150 V and 5 A, allowing use of alternate wiring methods complying with NFPA 70, Article 725.
2. Low Voltage: Listed and labeled for use in circuits supplied by a Class 1 or other power supply having rated output not greater than 1000 V, requiring use of wiring methods complying with NFPA 70, Article 300, Part I.

1.3 ACTION SUBMITTALS

A. Approved Permit Submittal: Submittals must be approved by authorities having jurisdiction prior to submitting them to Architect.

B. Product Data: For each type of product, including furnished options and accessories.

1. Include construction details, material descriptions, dimensions, profiles, and finishes.
2. Include rated capacities, operating characteristics, and electrical characteristics.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in "Documentation" section of "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, and details, including details of attachments to other Work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Annunciator panel details as required by authorities having jurisdiction.
5. Detail assembly and support requirements.
6. Include voltage drop calculations for notification-appliance circuits.
7. Include battery-size calculations.
8. Include input/output matrix.
9. Include written statement from manufacturer that equipment and components have been tested as a system and comply with requirements in this Section and in NFPA 72.
10. Include performance parameters and installation details for each detector.
11. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
12. Provide control wiring diagrams for fire-alarm interface to HVAC; coordinate location of duct smoke detectors and access to them.

    a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
    b. Show field wiring required for HVAC unit shutdown on alarm.
    c. Locate detectors in accordance with manufacturer's written instructions.

D. Field quality-control reports.

E. Qualification Statements: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

    a. Comply with "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
    b. Provide "Fire-Alarm and Emergency Communications System Record of Completion Documents" in accordance with "Completion Documents" Article in "Documentation" section of "Fundamentals" chapter in NFPA 72.
    c. Complete wiring diagrams showing connections between devices and equipment. Each conductor must be numbered at every junction point with indication of origination and termination points.
    d. Riser diagram.
    e. Device addresses.
    f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.

g. Record copy of site-specific software.
h. Provide "Inspection and Testing Form" in accordance with "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:

1) Equipment tested.
2) Frequency of testing of installed components.
3) Frequency of inspection of installed components.
4) Requirements and recommendations related to results of maintenance.
5) Manufacturer's user training manuals.

i. Manufacturer's required maintenance related to system warranty requirements.
j. Abbreviated operating instructions for mounting at FACU and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On USB media.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Personnel must be trained and certified by manufacturer for installation of units required for this Project.
2. Installation must be by personnel certified by NICET as fire-alarm Level III technician.
3. Obtain certification by NRTL in accordance with NFPA 72.
4. Licensed or certified by authorities having jurisdiction.

1.6 FIELD CONDITIONS

A. Seismic Conditions: Unless otherwise indicated on Contract Documents, specified Work in this Section must withstand the seismic hazard design loads determined in accordance with ASCE/SEI 7 for installed elevation above or below grade.

1. The term "withstand" means "unit must remain in place without separation of parts from unit when subjected to specified seismic design loads."

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail because of defects in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ADDRESSABLE FIRE-ALARM SYSTEM

A. Description:

1. Noncoded, UL-certified addressable system, with multiplexed signal transmission and horn-and-strobe notification for evacuation.

B. Performance Criteria:

1. Regulatory Requirements:

a. Fire-Alarm Components, Devices, and Accessories: Listed and labeled by a NRTL in accordance with NFPA 70 for use with selected fire-alarm system and marked for intended location and application.

2. General Characteristics:

a. Automatic sensitivity control of certain smoke detectors.
b. Fire-alarm signal initiation must be by one or more of the following devices and systems:

1) Manual stations.
2) Smoke detectors.
3) Duct smoke detectors.
4) Carbon monoxide detectors.
5) Automatic sprinkler system water flow.
6) Fire standpipe system.
7) Dry system pressure flow switch.

c. Fire-alarm signal must initiate the following actions:

1) Continuously operate alarm notification appliances.
2) Identify alarm and specific initiating device at FACU and remote annunciators.
3) Transmit alarm signal to remote alarm receiving station.
4) Unlock electric door locks in designated egress paths.
5) Activate alarm communication system.
6) Switch HVAC equipment controls to fire-alarm mode.
7) Close smoke dampers in air ducts of designated air-conditioning duct systems.
8) Activate emergency shutoffs for gas and fuel supplies, except for shutoffs serving legally required life-safety systems such as emergency generators.
9) Record events in system memory.

d. Supervisory signal initiation must be by one or more of the following devices and actions:

1) Valve supervisory switch.
2) Zones or individual devices have been disabled.
3) FACU has lost communication with network.

e. System trouble signal initiation must be by one or more of the following devices and actions:

1) Open circuits, shorts, and grounds in designated circuits.
2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3) Loss of communication with addressable sensor, input module, relay, control module, remote annunciator.
4) Loss of primary power at FACU.
5) Ground or single break in internal circuits of FACU.
6) Abnormal ac voltage at FACU.
7) Break in standby battery circuitry.
8) Failure of battery charging.

f. System Supervisory Signal Actions:

1) Initiate notification appliances.
2) Identify specific device initiating event at FACU and remote annunciators.
3) After time delay of 200 seconds, transmit trouble or supervisory signal to remote alarm receiving station.
4) Transmit system status to building management system.

g. Document Storage Box:

1) Description: Enclosure to accommodate standard 8-1/2-by-11 inch manuals and loose document records. Legend sheet will be permanently attached to door for system required documentation, key contacts, and system information. Provide two key ring holders with location to mount standard business cards for key contact personnel.
2) Material and Finish: 18-gauge cold-rolled steel; four mounting holes.
3) Color: Red powder-coat epoxy finish.
4) Labeling: Permanently screened with 1 inch high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
5) Security: Locked with 3/4 inch barrel lock. Provide solid 12 inch stainless steel piano hinge.

2.2 FIRE-ALARM CONTROL UNIT (FACU)

A. Manufacturers or equal: Subject to compliance with requirements:

1. Edwards; Carrier Global Corporation.
2. Fire-Lite Alarms; Honeywell International, Inc.
3. Gamewell-FCI; Honeywell International, Inc.
4. Notifier; Honeywell International, Inc.
5. Potter Electric Signal Company, LLC.

6. Siemens Industry, Inc., Building Technologies Division.
7. Silent Knight; Honeywell International, Inc.
8. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

B. Description: Field-programmable, microprocessor-based, modular, power-limited design with electronic modules.

C. Performance Criteria:

1. Regulatory Requirements: Comply with NFPA 72 and UL 864.
2. General Characteristics:

a. System software and programs must be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining information through failure of primary and secondary power supplies.
b. Include real-time clock for time annotation of events on event recorder and
c. Provide communication between FACU and remote circuit interface panels, annunciators, and displays.
d. FACU must be listed for connection to central-station signaling system service.
e. Provide nonvolatile memory for system database, logic, and operating system and event history. System must require no manual input to initialize in the event of complete power down condition. FACU must provide minimum 500-event history log.
f. Addressable Initiation Device Circuits: FACU must indicate which communication zones have been silenced and must provide selective silencing of alarm notification appliance by building communication zone.

1) Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: FACU must be listed for releasing service.

g. Fire-Alarm Annunciator: Arranged for interface between human operator at FACU and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and programming and control menu.

1) Annunciator and Display: LCD, 80 characters, minimum.
2) Keypad: Arranged to permit entry and execution of programming, display, and control commands.

h. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:

1) Pathway Class Designations: NFPA 72, Class B.
2) Pathway Survivability: Level 1.
3) Install no more than 50 addressable devices on each signaling-line circuit.
4) Install fault circuit isolators to comply with circuit performance requirements of NFPA 72 or with manufacturer's written instructions, whichever is more conservative.

i. Serial Interfaces:

1) One dedicated RS 485 port for remote station operation using point ID DACT.
2) One RS 485 port for remote annunciators, Ethernet module, or multi-interface module
3) One USB port for PC configuration.
4) One RS 232 port for air-aspirating smoke detector connection.

j. Notification-Appliance Circuit:

1) Audible appliances must sound in three-pulse temporal pattern, as defined in NFPA 72.
2) Visual alarm appliances must flash in synchronization where multiple appliances are in same field of view, as defined in NFPA 72.

k. Remote Smoke-Detector Sensitivity Adjustment: Controls must select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out final adjusted values on system printer.

l. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to remote alarm station.

m. Primary Power: 24 V(dc) obtained from 120 V(ac) service and power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory and DACT must be powered by 24 V(dc) source.

n. Alarm current draw of entire fire-alarm system must not exceed 80 percent of power-supply module rating.

o. Secondary Power: 24 V(dc) supply system with batteries, automatic battery charger, and automatic transfer switch.

p. Batteries: Sealed, valve-regulated, recombinant lead acid.

D. Accessories:

1. Instructions: Computer printout or typewritten instruction card mounted behind plastic or glass cover in stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe functional operation of system under normal, alarm, and trouble conditions.

2.3 MANUAL FIRE-ALARM BOXES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Edwards; Carrier Global Corporation.
2. Federal Signal Corporation.
3. Fire-Lite Alarms; Honeywell International, Inc.
4. Gamewell-FCI; Honeywell International, Inc.
5. Notifier; Honeywell International, Inc.
6. Potter Electric Signal Company, LLC.

7. Siemens Industry, Inc., Building Technologies Division.
8. Silent Knight; Honeywell International, Inc.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes must be finished in red with molded, raised-letter operating instructions in contrasting color; must show visible indication of operation; and must be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Double-action mechanism requiring two actions to initiate alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to FACU.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated, clear plastic enclosure hinged at top to permit lifting for access to initiate alarm. Lifting cover actuates integral battery-powered audible horn intended to discourage false-alarm operation.
4. Material: Manual stations made of Lexan polycarbonate.
5. Able to be used in indoor areas.

2.4 SYSTEM SMOKE DETECTORS

A. Photoelectric Smoke Detectors:

1. Manufacturers or equal: Subject to compliance with requirements:

a. Edwards; Carrier Global Corporation.
b. Fire-Lite Alarms; Honeywell International, Inc.
c. Gamewell-FCI; Honeywell International, Inc.
d. Notifier; Honeywell International, Inc.
e. Potter Electric Signal Company, LLC.
f. Siemens Industry, Inc., Building Technologies Division.
g. Silent Knight; Honeywell International, Inc.

2. Performance Criteria:

a. Regulatory Requirements:

1) NFPA 72.
2) UL 268.

b. General Characteristics:

1) Detectors must be two-wire type.
2) Base Mounting: Detector and associated electronic components must be mounted in twist-lock module that connects to fixed base. Provide terminals in fixed base for connection to building wiring.
3) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
4) Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
5) Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.

6) Operator at FACU, having designated access level, must be able to manually access the following for each detector:

a) Primary status.
b) Device type.
c) Present average value.
d) Present sensitivity selected.
e) Sensor range (normal, dirty, etc.).

7) Detector must have functional humidity range within 10 to 90 percent relative humidity.
8) Color: White.
9) Remote Control: Unless otherwise indicated, detectors must be digital-addressable type, individually monitored at FACU for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by FACU.
10) Multiple levels of detection sensitivity for each sensor.
11) Sensitivity levels based on time of day.

2.5 DUCT SMOKE DETECTORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Edwards; Carrier Global Corporation.
2. Fire-Lite Alarms; Honeywell International, Inc.
3. Gamewell-FCI; Honeywell International, Inc.
4. Notifier; Honeywell International, Inc.
5. Potter Electric Signal Company, LLC.
6. Siemens Industry, Inc., Building Technologies Division.
7. Silent Knight; Honeywell International, Inc.

B. Description: Photoelectric-type, duct-mounted smoke detector.

C. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.
b. UL 268A.

2. General Characteristics:

a. Detectors must be two-wire type.
b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
d. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.

e. Detector address must be accessible from FACU and must be able to identify detector's location within system and its sensitivity setting.
f. Operator at FACU, having designated access level, must be able to manually access the following for each detector:

1) Primary status.
2) Device type.
3) Present average value.
4) Present sensitivity selected.
5) Sensor range (normal, dirty, etc.).

g. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with supplied detector for smoke detection in HVAC system ducts.
h. Each sensor must have multiple levels of detection sensitivity.
i. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
j. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 CARBON MONOXIDE DETECTORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Notifier; Honeywell International, Inc.

B. Description: Carbon monoxide detector listed for connection to fire-alarm system.

C. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72
b. NFPA 720.
c. UL 2075.

2. General Characteristics:

a. Mounting: Adapter plate for outlet box mounting.
b. Testable by introducing test carbon monoxide into sensing cell.
c. Detector must provide alarm contacts and trouble contacts.
d. Detector must send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
e. Locate, mount, and wire in accordance with manufacturer's written instructions.
f. Provide means for addressable connection to fire-alarm system.
g. Test button simulates alarm condition.

2.7 MULTICRITERIA AND MULTISENSOR FIRE DETECTORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Edwards; Carrier Global Corporation.
2. Fire-Lite Alarms; Honeywell International, Inc.
3. Gamewell-FCI; Honeywell International, Inc.
4. Notifier; Honeywell International, Inc.
5. Potter Electric Signal Company, LLC.
6. Siemens Industry, Inc., Building Technologies Division.
7. Silent Knight; Honeywell International, Inc.

B. Description: Fire-sensing detectors using multiple means of detection.

C. Performance Criteria:

1. Regulatory Requirements:

   a. NFPA 72.

2. General Characteristics:

   a. Mounting: Twist-lock base interchangeable with smoke-detector bases.
   b. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to FACU.
   c. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. Detector must send trouble alarm if it is incapable of compensating for existing conditions.
   d. Test button tests sensors in detector.
   e. Operator at FACU, having designated access level, must be able to manually access the following for each detector:

      1) Primary status.
      2) Device type.
      3) Present sensitivity selected.
      4) Sensor range (normal, dirty, etc.).

   f. Detector must have functional humidity range within 10 to 90 percent relative humidity.
   g. Color: White.
   h. Comply with UL requirements.
   i. Sensors (Multisensor Type): Detector must be comprised of four sensing elements including smoke sensor, carbon monoxide sensor, infrared sensor, and heat sensor.

      1) Smoke sensor must be photoelectric type as described in "System Smoke Detectors" Article.
      2) Carbon monoxide sensor must be as described in "Carbon Monoxide Detectors" Article.
      3) Heat sensor must be as described in "Heat Detectors" Article.

4) Each sensor must be separately listed in accordance with requirements for its detector type.

2.8 FIRE-ALARM NOTIFICATION APPLIANCES

A. Fire-Alarm Audible Notification Appliances:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Edwards; Carrier Global Corporation.
   b. Federal Signal Corporation.
   c. Notifier; Honeywell International, Inc.
   d. Potter Electric Signal Company, LLC.
   e. Siemens Industry, Inc., Building Technologies Division.
   f. Simplex; brand of Johnson Controls International plc, Building Solutions North America.
   g. Wheelock, Life Safety and Mass Notification; Eaton, Electrical Sector.

2. Description: Horns, bells, or other notification devices that cannot output voice messages.
3. Performance Criteria:
   a. Regulatory Requirements:
      1) NFPA 72
   b. General Characteristics
      1) Connected to notification-appliance signal circuits, zoned as indicated, equippd for mounting as indicated, and with screw terminals for system connections.
      2) Horns: Electric-vibrating-polarized type, 24V(dc); with provision for housing operating mechanism behind grille. Comply with UL 464. Horns must produce sound-pressure level of 90 dB(A-weighted), measured 10 ft. from horn, using coded signal prescribed in UL 464 test protocol.
      3) Combination Devices: Factory-integrated auditable and visible devices in single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Fire-Alarm Visible Notification Appliances:

1. Manufacturers or equal: Subject to compliance with requirements:

   a. Edwards; Carrier Global Corporation.
   b. Federal Signal Corporation.
   c. Notifier; Honeywell International, Inc.
   d. Potter Electric Signal Company, LLC.
   e. Siemens Industry, Inc., Building Technologies Division.
   f. Simplex; brand of Johnson Controls International plc, Building Solutions North America.
   g. Wheelock, Life Safety and Mass Notification; Eaton, Electrical Sector.

2. Performance Criteria:

   a. Regulatory Requirements:

1) NFPA 72.
2) UL 1971.

b. General Characteristics:

1) Rated Light Output:
a) 15/30/75/110 cd, selectable in field.

2) Clear or nominal white polycarbonate lens mounted on aluminum faceplate.
3) Mounting: Wall mounted unless otherwise indicated.
4) Flashing must be in temporal pattern, synchronized with other units.
5) Strobe Leads: Factory connected to screw terminals.
6) Mounting Faceplate: Factory finished, white.

2.9 FIRE-ALARM REMOTE ANNUNCIATORS

A. Manufacturers or equal: Subject to compliance with requirements:

1. Bosch Security Systems, Inc.
2. Gamewell-FCI; Honeywell International, Inc.

B. Performance Criteria:

1. Regulatory Requirements:

a. NFPA 72.

2. General Characteristics:

a. Annunciator functions must match those of FACU for alarm, supervisory, and trouble indications. Manual switching functions must match those of FACU, including acknowledging, silencing, resetting, and testing.

1) Mounting: Surface cabinet, NEMA 250, Type 1.

b. Display Type and Functional Performance: Alphanumeric display and LED indicating lights must match those of FACU. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 FIRE-ALARM ADDRESSABLE INTERFACE DEVICES

A. Manufacturers or equal: Subject to compliance with requirements:

1. Bosch Security Systems, Inc.
2. Notifier; Honeywell International, Inc.

B. Performance Criteria:

1. Regulatory Requirements:

   a. NFPA 72.

2. General Characteristics:

   a. Include address-setting means on module.
   b. Store internal identifying code for control panel use to identify module type.
   c. Listed for controlling HVAC fan motor controllers.
   d. Monitor Module: Microelectronic module providing system address for alarm-initiating devices for wired applications with normally open contacts.
   e. Integral Relay: Capable of providing direct signal to circuit-breaker shunt trip for power shutdown.

      1) Allow control panel to switch relay contacts on command.
      2) Have minimum of two normally open and two normally closed contacts available for field wiring.

   f. Control Module:

      1) Operate notification devices.
      2) Operate solenoids for use in sprinkler service.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTERS (DACTs)

A. Manufacturers or equal: Subject to compliance with requirements:

1. Bosch Security Systems, Inc.
2. Edwards; Carrier Global Corporation.
3. Potter Electric Signal Company, LLC.

B. Performance Criteria:

1. Regulatory Requirements:

   a. NFPA 72.

2. General Characteristics:

   a. DACT must be acceptable to remote central station and must be listed for fire-alarm use.
   b. Functional Performance: Unit must receive alarm, supervisory, or trouble signal from FACU and automatically capture two telephone line(s) and dial preset number for remote central station. When contact is made with central station(s), signals must be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter must initiate local trouble signal and transmit signal indicating loss of telephone line to remote alarm receiving station over remaining line. Transmitter must automatically report telephone service restoration to central

station. If service is lost on both telephone lines, transmitter must initiate local trouble signal.

c. Local functions and display at DACT must include the following:

1) Verification that both telephone lines are available.
2) Programming device.
3) LED display.
4) Manual test report function and manual transmission clear indication.
5) Communications failure with central station or FACU.

d. Digital data transmission must include the following:

1) Address of alarm-initiating device.
2) Address of supervisory signal.
3) Address of trouble-initiating device.
4) Loss of ac supply.
5) Loss of power.
6) Low battery.
7) Abnormal test signal.
8) Communication bus failure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.

1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.

B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Preinstallation Testing: Perform verification of functionality of installed components of existing system prior to starting work. Document equipment or components not functioning as designed.

3.3 INSTALLATION OF EQUIPMENT

A. Comply with NECA 305, NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install electrical wiring to

comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."

1. Devices placed in service before other trades have completed cleanup must be replaced.
2. Devices installed, but not yet placed, in service must be protected from construction dust, debris, dirt, moisture, and damage in accordance with manufacturer's written storage instructions.

B. Install wall-mounted equipment, with tops of cabinets not more than 78 inch above finished floor.

C. Manual Fire-Alarm Boxes:

1. Install manual fire-alarm box in normal path of egress within 60 inch of exit doorway.
2. Mount manual fire-alarm box on background of contrasting color.
3. Operable part of manual fire-alarm box must be between 42 and 48 inch above floor level. Devices must be mounted at same height unless otherwise indicated.

D. Smoke- and Heat-Detector Spacing:

1. Comply with "Smoke-Sensing Fire Detectors" section in "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
2. Smooth ceiling spacing must not exceed 30 ft..
3. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas must be determined in accordance with Annex A or Annex B in NFPA 72.
4. HVAC: Locate detectors not closer than 36 inch from air-supply diffuser or return-air opening.
5. Lighting Fixtures: Locate detectors not closer than 12 inch from lighting fixture and not directly above pendant mounted or indirect lighting.

E. Install cover on each smoke detector that is not placed in service during construction. Cover must remain in place except during system testing. Remove cover prior to system turnover.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend full width of duct. Tubes more than 36 inch long must be supported at both ends.

1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.

G. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.

H. Remote Status and Alarm Indicators: Install in visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.

I. Audible Alarm-Indicating Devices: Install not less than 6 inch below ceiling. Install bells and horns on flush-mounted back boxes with device-operating mechanism concealed behind grille. Install devices at same height unless otherwise indicated.

J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inch below ceiling. Install devices at same height unless otherwise indicated.

K. Device Location-Indicating Lights: Locate in public space near device they monitor.

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplate must be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."
2. Nameplate must be laminated acrylic or melamine plastic signs with black background and engraved white letters at least 1/2 inch high.

3.5 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring in accordance with Section 260523 "Control-Voltage Electrical Power Cables."

C. Install nameplate for each control connection, indicating field control panel designation and I/O control designation feeding connection.

3.6 PATHWAYS

A. Pathways must be installed in EMT.

B. Exposed EMT must be painted red enamel.

3.7 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.

B. Make addressable connections with supervised interface device to the following devices and systems. Install interface device less than 36 inch from device controlled. Make addressable confirmation connection when such feedback is available at device or system being controlled.
   1. Smoke dampers in air ducts of designated HVAC duct systems.
   2. Electronically locked doors and access gates.
   3. Alarm-initiating connection to activate emergency lighting control.
   4. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
   5. Supervisory connections at valve supervisory switches.
   6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.

3.8 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals.

B. Install framed instructions in location visible from FACU.

3.9 GROUNDING

A. Ground FACU and associated circuits in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Ground shielded cables at control panel location only. Insulate shield at device location.

3.10 FIELD QUALITY CONTROL

A. Field tests must be witnessed by authorities having jurisdiction.

B. Administrant for Tests and Inspections:
   1. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Tests and Inspections:

   1. Visual Inspection: Conduct visual inspection prior to testing.

      a. Inspection must be based on completed record Drawings and system documentation that is required by "Completion Documents, Preparation" table in "Documentation" section of "Fundamentals" chapter in NFPA 72.
      b. Comply with "Visual Inspection Frequencies" table in "Inspection" section of "Inspection, Testing and Maintenance" chapter in NFPA 72; retain "Initial/Reacceptance" column and list only installed components.

   2. System Testing: Comply with "Test Methods" table in "Testing" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.
   3. Test audible appliances for public operating mode in accordance with manufacturer's written instructions. Perform test using portable sound-level meter complying with Type 2 requirements in ASA S1.4 Part 1/IEC 61672-1.
   4. Test audible appliances for private operating mode in accordance with manufacturer's written instructions.

5. Test visible appliances for public operating mode in accordance with manufacturer's written instructions.
6. Factory-authorized service representative must prepare "Fire Alarm System Record of Completion" in "Documentation" section of "Fundamentals" chapter in NFPA 72 and "Inspection and Testing Form" in "Records" section of "Inspection, Testing and Maintenance" chapter in NFPA 72.

D. Reacceptance Testing: Perform reacceptance testing to verify proper operation of added or replaced devices and appliances.

E. Fire-alarm system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system. Provide video recording of training to Owner.

3.12 MAINTENANCE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service must include 12 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies must be manufacturer's authorized replacement parts and supplies.

1. Include visual inspections in accordance with "Visual Inspection Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
2. Perform tests in "Test Methods" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
3. Perform tests per "Testing Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.13 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning at Substantial Completion, service agreement must include software support for two years.

C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software must include operating system and new or revised licenses for using software.

1. Upgrade Notice: At least 15 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

END OF SECTION 284621.11

SECTION 32 13 13 – CONCRETE PAVING

PART 1- GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings
2. Retaining walls
3. Freestanding sat walls
4. Slabs-on-grade

1.3 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.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Welding certificates.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

C. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.7 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

1.8 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

1.9 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut bars true to length with ends square and free of burrs.

1.10 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/II. Supplement with the following:

a. Fly Ash: ASTM C 618, Class C

B. Normal-Weight Aggregates: ASTM C 33, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

1.11 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

1.12 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products or equal: Subject to compliance with requirements:
   a. Burke by Edoco; BurkeFilm.
   b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Aquafilm.
   c. Dayton Superior Corporation; Sure Film.
   d. Euclid Chemical Company (The); Eucobar.
   e. MBT Protection and Repair, Div. of ChemRex; Confilm.

f. Meadows, W. R., Inc.; Sealtight Evapre.
g. Sika Corporation, Inc.; SikaFilm.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products or equal: Subject to compliance with requirements:
a. Burke by Edoco; Aqua Resin Cure.
b. ChemMasters; Safe-Cure Clear.
c. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
d. Euclid Chemical Company (The); Kurez DR VOX.
e. Meadows, W. R., Inc.; 1100 Clear.

1.13 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

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. Types I and II, non-load bearing for bonding hardened or freshly mixed concrete to hardened concrete.

D. Reglets: Fabricate reglets of not less than 0.0217-inch- (0.55-mm-) thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

1.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use high-range water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

1.15 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi (20.7 MPa at 28 days.
2. Slump Limit: 5 inches, plus or minus 1 inch (25 mm).
3. Air Content: 5 percent, plus or minus 1.0 percent at point of delivery

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi (20.7 MPa at 28 days.
2. Slump Limit: 5 inches, plus or minus 1 inch (25 mm).
3. Air Content: 5 percent, plus or minus 1.5 percent.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
2. Slump Limit: 4 inches plus or minus 1 inch (25 mm).
3. Air Content: 5 percent, plus or minus 1.0 percent at point of delivery

1.16 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

1.17 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. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

2.1 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 347R as abrupt or gradual, as follows:
1. Class B, 1/4 inch for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

2.2 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. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

2.3 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 (10 deg C) for 24 hours after placing concrete. If concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

2.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

2.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
5. 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 (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-(3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 7 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.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

2.6 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 fabricates joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

2.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete

embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

2.8 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.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
   1. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part Portland cement and one-part fine sand with a 1:1 mixture of bonding agent and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

2.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete 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.

2.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

      a. Water.

b. Continuous water-fog spray.
c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer [unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project].

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

2.11 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least [one] [six] month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

2.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one-part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling, and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop outs, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in

contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

2.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100-cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.

a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

END OF SECTION 32 13 13

SECTION 32 14 16 - UNIT PAVERS

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. Concrete pavers set in aggregate and mortar setting beds.
B. Related Sections include the following:
   2. Division 2 Section "Earthwork" for excavation and compacted subgrade.
   3. Division 3 Section "Cast-in-Place Concrete" for concrete base under unit pavers.
   4. Division 7 Section "Joint Sealants" for sealing control and expansion joints in unit pavers with elastomeric sealants.

1.3 SUBMITTALS

A. Product Data: For materials other than water and aggregates.
B. Product Data: For the following, including manufacturer's product warranty:
   1. Pavers.
   2. Mortar and grout materials.
   3. Bedding and joint materials.
   4. Edge restraints.
C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
D. Samples for Initial Selection: For the following:

   1. Joint materials involving color selection.
E. Samples for Verification:
   1. Full-size units of each type of unit paver indicated
   2. Edge restraints.
F. Compatibility and Adhesion Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. Preconstruction Compatibility and Adhesion Testing: Submit to latex-additive manufacturer, for testing indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.

C. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be non-staining to, installed pavers and other materials constituting paver installation.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Approved mock-up shall become standard for tolerances and appearance
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
3. Construct mock-ups of a minimum 5'x5' area for each type of paver pattern shown in drawings.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained, and contamination avoided.

D. Store liquids in tightly closed containers protected from freezing.

E. Store asphalt cement and other bituminous materials in tightly closed containers.

1.6 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Mortar and Grout:

1. Cold-Weather Requirements: Protect unit paver work against freezing when ambient temperature is 40 deg F and falling. Heat materials to provide mortar and grout temperatures between 40 and 120 deg F. Provide the following protection for completed portions of work for 24 hours after installation when the mean daily air temperature is as indicated: below 40 deg F, cover with weather-resistant membrane; below 25 deg F, cover with insulating blankets; below 20

deg F, provide enclosure and temporary heat to maintain temperature above 32 deg F.

2. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F and higher.
   a. When ambient temperature exceeds 100 deg F, or when wind velocity exceeds 8 mph and ambient temperature exceeds 90 deg F, set pavers within 1 minute of spreading setting-bed mortar.

1.7 WARRANTY

A. Provide warranty covering precast concrete paving units against defects in material and workmanship for a period of 5 years. Unusual abuse and neglect are excepted.

PART 2 - PRODUCTS

2.1 PAVERS

A. Clay Pavers:
   1. Manufacturers or equal: Subject to compliance with requirements:
      Pine Hall Brick
      2701 Shorefair Drive
      Winston-Salem, NC 27105
      (800) 334-8689
   2. Products:
      a. English Edge Clay Pavers: 2-1/4" x 4" x 8"
   3. Color: Full Range; provide mockup for Landscape Architect's approval
   4. Sealer:
      a. Factories apply one coat of penetrating sealer to all surfaces of pavers.
      b. Sealer shall be non-staining, penetrating material, suitable for exterior use, type which does not discolor or darken the surface
      c. Conform to sealer manufacturer's recommendations for application of sealer.

2.2 ACCESSORIES

A. Aluminum Edge Restraints: L-shaped, .075" thick by 1-3/4-inch- high extruded-aluminum edging.

1. Manufacturers or equal: Subject to compliance with requirements.
   a. Permaloc Corporation – Brick Block (800) 356-9660
   b. Finsh: (MF) Mill Finish – Natural Aluminum

2.3 AGGREGATE MATERIALS

A. Bedding Sand: ASTM C 33 graded sand, bagged, clean and very dry (concrete sand). Sand free to elements toxic to plant growth. Naturally occurring silica sands.
   1. Manufacturer: martin Marietta materials Chico Quarry, Chico, TX, (940) 243-8520 or equal

B. Joint Sand: ASTM C144 graded sand, bagged, clean and very dry (mason's sand). San free of elements toxic to plant growth.
   1. Manufacturer: martin Marietta materials Chico Quarry, Chico, TX, (940) 243-8520 or equal

C. Joint San Stabilizer Sealer: Surebond SB-1300-1370. Surebond Inc., Schamburg, IL, (847) 84301818

2.4 MORTAR SETTING-BED MATERIALS

A. Portland Cement: ASTM C 150, Type I or II.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144.

D. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering latex additives that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturers or equal: Subject to compliance with requirements, provide latex additive.
      a. Bonsal, W. R. Company.
      b. Bostik Findley Inc.
      c. C-Cure.
      d. DAP Inc.
      e. Laticrete International, Inc.
      f. MAPEI Corp.
      g. SGM.

E. Water: Potable.

F. Reinforcing Wire: Galvanized, welded, 0.062-inch- diameter wire; 2-by-2-inch mesh; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.

G. Water: Potable.

2.5 MORTAR AND GROUT MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimum performance characteristics. Discard mortars and grout if they have reached their initial set before being used.

B. Mortar-Bed Bond Coat: Mix neat cement or cement and sand with latex additive or water to a creamy consistency.

C. Latex-Modified, Portland Cement Setting-Bed Mortar: Proportion and mix portland cement, sand, and latex additive for setting bed to comply with written instructions of latex-additive manufacturer and as necessary to produce stiff mixture with a moist surface when bed is ready to receive pavers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

2. Where pavers are to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations. Examine areas where waterproofing system is turned up or flashed against vertical surfaces and horizontal waterproofing. Proceed with installation only after protection is in place.

3.2 PREPARATION

A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.

B. Clean concrete substrates to remove dirt, dust, debris, and loose particles.

C. Proof-roll prepared subgrade according to requirements in Division 2 Section "Earthwork" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Joint Pattern: As indicated in drawings.

E. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.

F. Tolerances: Do not exceed 1/16-inch unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches and 1/4 inch in 10 feet from level, or indicated slope, for finished surface of paving.

G. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide foam filler as backing for sealant-filled joints. Install joint filler before setting pavers. Sealant materials and installation are specified in Division 7 Section "Joint Sealants."

H. Expansion and Control Joints: Provide joint filler at locations and of widths indicated. Install joint filler before setting pavers. Make top of joint filler flush with top of pavers.

I. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.

1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
2. For metal edge restraints with top edge exposed, drive stakes at least 1 inch below top edge.
3. Install job-built concrete edge restraints to comply with requirements in Division 3 Section "Cast-in-Place Concrete."
4. Where pavers set in mortar bed are indicated as edge restraints for pavers set in aggregate setting bed, install pavers set in mortar and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.
5. Where pavers embedded in concrete are indicated as edge restraints for pavers set in aggregate setting bed, install pavers embedded in concrete and allow concrete to cure before placing aggregate setting bed and remainder of pavers. Hold top of concrete below aggregate setting bed.

J. Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers.

1. Where pavers set in mortar bed are indicated for steps constructed adjacent to pavers set in aggregate setting bed, install steps, and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of laboratory density.

B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.

D. Place aggregate subbase and base, compact to 100 percent of ASTM D 1557 maximum laboratory density, and screed to depth indicated.

E. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.

F. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant, and density is loose and constant until pavers are set and compacted.

G. Treat leveling course with herbicide to inhibit growth of grass and weeds.

H. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.

   1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

I. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:

   1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
   2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches of the laying face. Cover pavers that have not been compacted, and leveling course on which pavers have not been placed, with non-staining plastic sheets to protect them from rain.

J. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

K. Do not allow traffic on installed pavers until sand has been vibrated into joints.

L. Repeat joint-filling process 30 days later.

3.5 MORTAR SETTING-BED APPLICATIONS

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply mortar-bed bond coat over surface of concrete subbase about 15 minutes before placing setting bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch thickness for bond coat.

C. Apply mortar bed over bond coat immediately after applying bond coat. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Place reinforcing wire over concrete subbase, lapped at joints by at least one full mesh and supported so mesh becomes embedded in the middle of setting bed. Hold edges back from vertical surfaces approximately 1/2 inch.

E. Place mortar bed with reinforcing wire fully embedded in middle of setting bed. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

F. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set before placing pavers.

G. Wet brick pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Place pavers before initial set of cement occurs. Immediately before placing pavers on setting bed, apply uniform 1/16-inch- thick, slurry bond coat to bed or to back of each paver with a flat trowel.

I. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set or disturb pavers for purposes of realigning finished surfaces or adjusting joints.

J. Spaced Joint Widths: Provide hand-tight nominal joint width with variations not exceeding plus or minus 1/16 inch.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point up joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

1. Remove temporary protective coating from brick pavers as recommended by protective coating manufacturer and as acceptable to unit paver and grout manufacturer. Trap and remove coating to prevent it from clogging drains.

END OF SECTION

SECTION 32 18 16 - PLAY EQUIPMENT

PART 1- GENERAL

1.1 SUMMARY

A. This Section describes the requirements for materials and installation of play areas, play equipment, and accessory items, including:

1. Manufactured play equipment.

B. Related Sections:

1. Division 00 Bidding Requirements

C. Variances:

1. The Contractor/Manufacturer shall submit with their bid a list of all variances from these specifications.

1.2 REFERENCES

A. The General Conditions, Supplementary Conditions, and applicable portions of Division One applies to the work of this Section as if printed herein.

B. ASTM 1292– Standard Specification for Impact Attenuation Under and Around playground equipment.

C. Safety Guidelines and Standards:

1. All materials and equipment shall conform to the current issue of the "Handbook for Public Playground Safety" published by the Consumer Product Safety Commission (C.P.S.C.) and ASTM F1487-01. The manufacturer and installation contractor shall be responsible for correcting any product violations of the C.P.S.C. Guidelines and ASTM F1487-01, to the satisfaction of the Landscape architect, should they be found after installation.

2. ADA Accessibility Guidelines (ADAAG) Section 15.6 Play Areas.

1.3 SUBMITTALS

A. Product Data: Submit manufacturers or supplier's description and technical data on the following items:

1. All play equipment.

2. All product data.

B. Samples: Submit samples and manufacturer's description of the following items:

1. Sample of all play structure colors; 6"x6" or 6" long samples of each.

C. Shop drawings:

1. The Contractor/Manufacturer's Representative shall submit for approval prior to delivery scaled drawings of each specified component including dimensioned plans, color charts, erection drawings, installation details, parts list, and technical data for correct assembly of all components, clamp details, and anchoring details.

2. Shop drawings shall bear the seal of a licensed Professional Engineer registered in the state of Florida.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Contractor and personnel experienced in this work and engaged in this type of work at least 2 years. Submit written proof of such.

B. Supervise the work constantly and, as far as possible, keep the same foreman and workers on the job from commencement to completion. The workmanship of the entire job must in every way be first class, and only experienced and competent workers will be allowed on the job.

C. Construction shall meet the guidelines of the Handbook for Public Playground Safety.

D. Field test sand at the site to confirm delivered material meets impact-attenuation requirements.

1.5 WARRANTY

A. The Contractor shall provide information on the equipment manufacturer's guarantee. Contractor shall warranty installation workmanship of all play equipment for a period of one year starting on the date of Physical Completion of the Project.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Delivery products in manufacturer's standard containers bearing original labels showing quantity, analysis, and name of manufacturer.

B. Protect material from damage during delivery and store under tarp when time from delivery to installation exceeds one week.

C. Broken Containers: Material in broken containers or showing evidence of damage will be rejected and shall be immediately removed from site.

1.7 PROJECT CONDITIONS

A. It is essential that the work site and adjacent areas be cleaned, neat and orderly at all times. Remove all debris and waste materials and all excess earth materials at least once a day and more if appropriate.

B. Review installation procedures and coordinate site furnishing installation work with other work affected.

C. All hard surface paving adjacent to play areas, including concrete walks and concrete paving must be completed prior to installation of safety surface and play equipment.

1.8 EXISTING CONDITIONS

A. Become acquainted with all site conditions and inform Landscape Architect of conditions which will prevent proper provision of this work.

PART 2 - PRODUCTS

2.1 PLAY EQUIPMENT

A. See Plans for manufacturer and product specifications for each site.

2.2 FINISHES

A. Polyester (Powder) Coating– The polyester coating shall be uniformly applied by the electrostatic method to a thickness of three to five mils. Promptly after application of the powder, the coating shall be oven-cured at 400 degrees Fahrenheit. The color(s) of the polyester coating shall be as selected by the Landscape Architect from the manufacturer's standard and/or custom color selection charts.

B. Vinyl- The vinyl coating shall be oven-cured poly-vinyl chloride plastisol with a minimum thickness of 1/8". The coating shall contain ultraviolet inhibitors and mold resistors. The color(s) of the vinyl coating shall be as selected by the Landscape architect from the manufacturer's standard and/or custom color selection charts.

C. Galvanized Finish- All components calling for a galvanized finish shall be hot-dipped galvanized to the manufacturer's standard after fabrication. All galvanized surfaces shall be free of burs, splinters, and sharp edges.

2.3 ADDITIONAL HARDWARE

Additional hardware shall be provided in sufficient quantity to complete assembly of the play equipment. All hardware shall be non-ferrous or is ferrous material is used shall be galvanized, electrostatic zinc plated, or polyester powder coated in accordance with the approved manufacturer's standard. Provide the Landscape architect with any and all maintenance and repair supplies, installation manuals, tool kits and materials shipped with each product for the Owner's inventory.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination of work area- Examine the areas and conditions under which work of this Section will be performed.

B. Verify safety zones of all equipment before setting posts in concrete footings.

C. Do not proceed until conditions detrimental to proper and timely completion of the work have been satisfactorily corrected and thus meet the manufacturer's instructions and the requirements of safety guidelines and standards, above.

D. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 INSTALLATION OF COMPOUND STRUCTURES AND INDEPENDENT ACTIVIES

A. Conform strictly to manufacturer's instructions using all appropriate materials, tools, and accessories as required. Use only experienced personnel trained in play equipment construction. Layout all equipment prior to construction to ensure compliance with safety zone clearances.

B. Provide all concrete footings as required to properly place the equipment components. It is the Contractor's responsibility to adjust drainage pipe or other new utility locations to accommodate the equipment footings.

3.3 PROTECTION

A. During construction of the play equipment structure, provide PVC web fence material in sufficient quantities and wrap the structures to prevent public access onto the equipment.

3.4 INSPECTION

A. Following the Landscape Architect's inspection of the completed play equipment installation, perform repairs as necessary to meet or exceed the Landscape Architect's requirements for fit and finish and the specifications and guidelines as referenced in 1.2.C. Safety Guidelines and Standards, above.

3.5 CLEAN UP

A. Keep Work clean; remove excess materials and droppings daily.

B. Thoroughly clean site of all building materials and accessories that might be dangerous to children.

3.6 FINISH WORK

A. All play equipment, athletic features and other installed items shall be firmly secured and level without any movement.

B. Replace unsatisfactory installations.

END OF SECTION 32 18 16

SECTION 32 18 17 – POURED-IN-PLACE RUBBER SURFACING

PART 1– GENERAL

1.1 SUMMARY

A. General: Provide resilient surfacing, complete, as shown and specified per Contract Documents.

B. Perform all operations necessary for the proper execution and completion of all work in accordance with the Drawings and Specifications. Playground surfacing shall include: Providing, transporting, and installing all playground surfaces. Playgrounds are both on-structure and at grade and therefore waterproofing must be included where appropriate. See Architectural drawings and specifications for waterproofing.

C. Related Sections:
1. Division 00 Bidding Requirements
2. Division 01 General Requirements
3. 03300 Cast-in-place Concrete

1.2 SUBMITTALS

A. Samples: Submit samples and manufacturer's description of the following items:

1. GT IMPAX POURED, Recycled Poured Rubber Surfacing; Poured in Place Material: Each color and specified thickness on
12" x 12" x ¼" thick plywood panels.

B. Product Data: Manufacturer's specifications, data and installation instruction.

C. Supplier's written warranty and independent laboratory results for tests required in Section 1.5.

1.3 PRODUCT CONDITIONS

A. Environmental Requirements: Do not apply materials during adverse weather or when surface and ambient temperature are below 40 degrees F., unless otherwise approved by manufacturer.

B. Adjacent materials and resilient surfacing materials shall be protected from weather or damage during installation while curing and/or unattended.

1.4 QUALITY ASSURANCE

A. Requirements: Perform work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work.

B. Test Results:
1. Impact Attenuation– ASTM F1292-99 and ASTM 1292-96: Impact attenuation test results shall be provided to the owner or owner's representative. These test results shall be certified and submitted on the letterhead of an independent testing lab. Impact attenuation test results shall meet or exceed Consumer Product Safety Commission Guidelines for impact attenuation (G-max and Head Injury Criteria (HIC).

2. Accessibility of Surface Systems– ASTM F1951-99: All Playground surfacing products must pass testing to ensure wheelchair access under and around playground equipment as required by the American Disabilities Act.
3. Coefficient of Friction– ASTM D2047-82: All products must meet a minimum standard on coefficient of friction of .9-wet, 1.0-dry.
4. Permeability: Product shall meet or exceed a coefficient of permeability of 0.4 gallons per square yard per second.
5. Flammability of Finished Floor cover– ASTM D2859: Product shall meet requirements of ASTM D2859.
6. Tensile Strength ASTM D412-87: This test indicates a product's ability to stretch, and how far it will stretch before it breaks. Test results for wear course must be a minimum tensile strength of 60 PSI and minimum % elongation @ break of 140%.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver all materials in original unopened packages with labels intact, and store all materials protected from weather and at temperatures not less than 40 degrees F.

PART 2 - MATERIALS

2.1 Manufacturers or equal: Subject to compliance with requirements.

A. GT IMPAX POURED, Recycled Poured Rubber Surfacing (basis of specification) or approved equal: c/o GameTime, P.O. Box 680121, Fort Payne, AL 35968, (800) 235-2440

1. Contact: Kight Jones

B. Installer: The applicator shall be trained and registered by the manufacturer.

C. Substitutions: Under provision of Section 01600

2.2 MATERIALS

A. Primer: Single component, moisture– cured, polyurethane primer

B. Binder: Proprietary, elastic polyurethane prepolymer, MDI based, manifesting extremely low odor and capable of excellent weathering and binding characteristics. Binder shall contain no more than 0.2% TDI monomers.

C. Black SBR Rubber: Recycled, cryogenically processed, chopped to 1-mm, 3-mm or 3/8" shredded granules and containing less than 4% dust, packed in suitable bags to protect SBR from moisture.

D. EPDM Rubber: Man-made rubber containing minimum of 30% EPDM and having density of 1.5 – 0.05.

E. Thinner C: Use for cleaning tools.

F. Color granules: 50% Tan, 50% Black. All colors to be approved in sample by Landscape Architect.

G. Compacted stone base: Stone shall be uniformly mixed in an approved pubmill or on a mixing table or by other mechanical means (such as quarry blending operations) prior to placement on the subgrade. Test samples will be taken after mixing, and the material shall conform to specified requirements prior to placement on the subgrade. The material shall be wetted during mixing operations if necessary for proper blending.

1. Stone gradation:

US Sieve	Percent Passing
1-1/2"	100
1"	90-100
¾"	70-100
No. 4	35-65
No. 40	12-32
No. 200	5-12

2. Porosity

   a. Stone base course must maintain extreme porosity for direct drainage. Care must be taken not to choke off porosity with excessive smaller stone, dust and/or fines.

3. Compaction

   a. Density requirement is 95% compaction with final condition of stone as stable, so as to not shift when traveled on or during surface installation process.

4. Slope

   a. Stone elevation must maintain slope of ¼" per foot toward surface drain and shall vary no more than 1/8" when measured in any direction with a 10' straight edge

5. Depth

   a. 9" Minimum thickness.

PART 3 - EXECUTION

3.1 INSPECTION

A. General: Examine substrate to receive resilient surfacing. Give written notification of deficiencies. Substrates shall be free of voids, projections, fins, honeycombs, and other detrimental imperfections and shall have been compacted to 95% where applicable in at grade applications. Do not proceed until unsatisfactory conditions are corrected.

B. Moisture Test: Test horizontal substrates to determine acceptable dryness. Test method shall be as recommended by resilient surfacing manufacturer.

C. Penetrations: Ensure that penetrations such and anchors pipes and conduits are securely fastened to substrate where applicable.

3.2 PREPARATION

A. Scheduling– GT Impax recycled poured rubber surfacing shall be installed after the playground equipment is installed an after the subsurface is ready to receive surface. The temperature should be 40 degrees and rising during installation of surface.

   1. Thickness– Total depth of the surface shall be as specified by the owner or architect for your project. Surface thickness will vary in impact course according to fall height. Playground Area 'A' shall have an impact course depth of 2". Playground Area 'B' shall have an impact course depth of 3 ½".

   2. Impact Course– The impact course must be composed of recycled rubber and be free of foreign matter. The impact course will be poured in place by means of

screeding and hand-troweled to maintain a seamless application. All rubber in the impact course will be of a select quality and consistent blend of recycled rubber sizes to achieve maximum porosity and minimum residue.

3. Wear Course– The 3/8" minimum wear course material shall be composed of EPDM granular rubber only. The wear course will have a minimum weight of 2.2 pounds per square foot. The wear course will be poured in place by means of screeding and hand-troweled to maintain a seamless application. All rubber shall remain consistent in gradation and size.

   If graphic designs and color transitions are to be used, they shall be full wear course depth.

4. Edges– Surface edges shall be flush with edge of adjacent area or tapered to provide safe transition. Surface shall be sloped to drain as indicated on plans.

5. Large Areas– All areas in excess of 2000-sq.ft. or that require adjacent color pours will have a cold joint or seam due to the nature of the installation process. Although seldom visible, large areas or adjacent colors require the material to be installed on separate days.

B. Clean and prepare substrate per resilient surfacing manufacturer's recommendations where applicable. Concrete substrates shall be dry, smooth, and free from dust and foreign matter, deleterious and excess materials, and projections. Compacted rock subgrade shall be prepared as above.

3.3 MIXING

A. General: Mix components only in amounts which can be applied within recommended application life. Discard material not used within application life.

3.4 APPLICATION

A. General: Apply per manufacturer's recommendations and as specified.

B. Precaution: Take necessary precautions against fire and other hazards during delivery, storage, and installation of inflammable materials. Comply with local ordinances and fire regulations in installation of hazardous materials.

C. Priming and Flashing: Prime coat surfaces, seal cracks and provide integral flashing at vertical surfaces and corner.

D. Application:

1. Primer: Apply with a short-nap roller at a rate of 300 square feet per gallon.

2. SBR Base Mat:

   a. Mix SBR to binder in a ration of 82/18.
   b. Spread evenly at specified thickness.
   c. Compact and allow to dry for a minimum of 24 hours.

3. Primer: Apply at the rate of 300 square feet per gallon.

4. Wearing Course:

   a. Mix EPDM to GT Impax binder in a ration of 82/18.
   b. Apply with a steel trowel.

      1) Compacting: Lubricate trowel with diesel fuel or soapy water.

2) Finishing: Spray a light mist of water on surface, and trowel smooth.

E. Curing: Allow cure time as recommended by manufacturer for temperature, humidity, and methods used before permitting any traffic.

3.4 PROTECTION

A. Provide temporary protection to prevent cutting, gouging, or other damage to resilient surfacing. Repair or replace damaged work.

END OF SECTION 32 18 17

SECTION 32 18 17.1 – COURT MARKINGS

PART 1– GENERAL

1.1 SUMMARY

A. This specification covers the application of a finely textured wearing surface for multisport play areas on asphalt and concrete surfaces. Existing surfaces should be properly sloped for good drainage and free from cracks. The success of the surfacing system is dependent upon the base, asphalt and/or concrete being adequate for the climate and end use.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Plexipave Court Patch Binder– shall conform to CPC Specification 10.14

B. Acrylotex MA– Shall conform to CPC specification 10.25 (contains 60-80 mesh fillers)

C. Acrylotex LA– Shall conform to CPC specification 10.25 (contains 80-100 mesh fillers)

D. Plexichrome– shall conform to CPC specification 10.1

E. Portland Cement– Type I (White)

F. Plexicolor Line Paint– shall conform to CPC specification 10.4

G. Water– shall be fresh and potable

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Allow new asphalt to cure a minimum of 14 days and new concrete to cure for a minimum of 28 days. Do not allow the use of curing agents. Do not allow a steel trowel finish on concrete.

B. Pressure clean the entire surface. Power blowers should be used to remove dust and debris. Pressure washing may be needed to remove stains. Pressure should be less than 2,500 lbs./in2.

C. Prior to the application of surfacing materials, the entire surface should be flooded and checked for minor depressions or irregularities. Any puddle area covering a nickel shall be marked and repaired with Court Patch Binder using the following mix:

1. 100 lbs. 60-80 mesh silica sand (dry)
2. 3 gallons Plexipave Court Patch Binder
3. 1-2 gallons Portland Cement (dry) depending on humidity and temperature

D. A tack coat consisting of 1 part Court Patch Binder and 2 parts water shall be applied to the patch areas and allowed to dry thoroughly prior to patching. Cracks should be filled with Court Patch Binder mix or crack- filling products compatible with acrylic finishes.

3.2 INSTALLATION

A. Base Texture/Play Courses

1. Acrylotex MA and Plexichrome shall be blended by a mechanical mixer to obtain a smooth homogeneous blend and applied with a rubber bladed squeegee in at least two applications to achieve a total application rate of .12-.18 gal./sy. prior to dilution. No application shall be covered by a succeeding application until thoroughly cured.

2. Acrylotex MA and Plexichrome shall be mixed as follows:

   a. Acrylotex MA– 30 gallons
   b. Plexichrome– 10 gallons (up to 20 gal. maybe added for additional color intensity)
   c. Water– 20 gallons
   d. Portland Cement– Type I (White)– 1-2 gallons of Portland cement shall be blended slowly with the water. The cement adds hardness and enhances drying.

B. Surface Texture/Play Course

1. Acrylotex LA and Plexichrome shall be blended by a mechanical mixer to obtain a smooth homogeneous blend and applied with a rubber bladed squeegee to achieve a total application rate of at least .05 gal./sy. prior to dilution.
2. Acrylotex LA and Plexichrome shall be mixed as follows:
   a. Acrylotex LA– 30 gallons
   b. Plexichrome– 10 gallons (up to 20 gal. maybe added for additional color intensity)
   c. Water– 20 gallons
   d. Portland Cement– Type I (White)– 1-2 gallons of Portland cement shall be blended slowly with the water. The cement adds hardness and enhances drying.

C. Playing Lines

1. After the surface has thoroughly dried the designated game lines shall be marked in accordance with the drawings. The markings shall be made using Plexicolor Line Paint on the designated color.

END OF SECTION 32 18 17.1

SECTION 32 3113 – VINYL-COATED CHAIN LINK FENCING

PART 1 - GENERAL

1.1 SUMMARY

A. Work Includes: Provide fabricated chain link fence system complete, as shown and specified per Contract Documents.
B. Section Includes: PVC or polyolefin elastomeric-coated chain link fencing and accessories for commercial use.
C. Related Sections:

1. Division 00 Bidding requirements.
2. Division 01 General requirements.
3. Section32 9000 – Landscaping

1.2 QUALITY ASSURANCE

A. Perform work in accordance with all applicable laws, codes, and regulations by authorities having jurisdiction over such work, and provide for all inspections and permits required by federal, state, and local authorities in furnishing, transporting, and installing materials.
B. General Responsibility: The Contractor shall be directly responsible for protection and welfare of all existing improvements within the Contract Limit of Work that are noted to remain.
C. Qualifications of Workmen: Provide at least one person approved by the City who shall be present at all times during chain link fence installation, who shall be thoroughly familiar with the type of work involved, and who shall direct and supervise, full-time, work.

1.3 WARRANTY

A. Chain link fence system shall have a 15-year minimum manufacturer's warranty from structural and cosmetic failure.

1.4 SUBMITTALS

A. Changes in specifications may not be made after the date specified in Division 1.
B. Product Data: Submit manufacturer's literature, data and catalog cuts indicating material compliance and specified options for the following:
1. Chain link wire mesh panels, accessories and posts.
2. Submit typed listing of all products used for this Section.
C. Samples: Submit samples of the Color selection for PVC finishes. If requested, submit samples of materials (e.g., fabric, wires, and accessories).
D. Shop Drawings: Prepare and submit dimensioned shop drawings detailing chain link fencing system, including property line and layout of fences with dimensions, details, and finishes of components, accessories, and post foundations. Include critical dimensions and panel layout using modular grid.
E. Mock up: Prepare mock-up of the following:

1. Chain link fence panel with top/bottom rails and accessories attached to 2 posts in footings.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver products in manufacturer's standard containers, bearing original labels showing quantity, content, and name of manufacturer.
B. Store products to protect from weather or other conditions which would damage or impair the effectiveness of product and comply with manufacturer's storage instructions.
C. Broken Containers: Materials in broken containers or showing evidence of damage will be rejected and shall be immediately removed from site.

1.6 PROJECT SITE CONDITIONS AND COORDINATION

A. Sequencing Schedule: Coordinate and cooperate with other trades to enable the work to proceed as rapidly and efficiently as possible.
B. Field verify conditions and materials. Field verify dimensions for chain link fencing installations and location of property line. Review information with City Representative.
C. Verify location and existence of drainage structures and utilities. Protect existing improvements and utilities from damage due to construction activity. Repair damage to items, as directed by City.
D. Verify work by other trades as required for coordination with chain link fence system including concrete curb and paving, drains, utilities and irrigation.
E. Protect improvements: repair or replace all damaged items; protect completed work.
F. Keep work site and all adjacent areas clean, neat and orderly at all times. Remove debris and waste materials and at least once a day and more often if appropriate.

PART 2 - PRODUCTS

2.1 Manufacturers or equal: Subject to compliance with requirements.

A. Products from qualified manufacturers having a minimum of five years experience manufacturing thermally fused chain link fencing will be acceptable by the architect as equal if they meet the following specifications for design, size gauge of metal parts and fabrication.
B. Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source.
C. Basis of Design Manufacturer or equal: Anchor Fence/Master Halco, Baltimore, Maryland; Phone (410) 676-2477 Fax (410) 676-7098.

2.2 CHAIN LINK FENCE FABRIC

A. PVC or polyolefin elastomeric coating, 7 mil (0.18mm), thermally fused to zinc-coated steel core wire: Per ASTM F668 Class 2b. Core wire tensile strength 75,000 psi (517 MPa).
B. Size: Helically wound and woven to height of five (3') feet [or as otherwise indicated on drawings] with two inch (2") diamond mesh, 9 gauge, with a core wire diameter of 0.097" 0.148" and a breakload strength of 1290 lbf. Color (ASTM

F 934) shall be Black.

C. Selvage of fabric knuckled at top and knuckled at bottom.

2.3 STEEL FENCE FRAMING

A. Formed steel ("C") sections: Roll formed steel shapes complying with ASTM F 1043, Group II, produced from 45,000 psi (310 MPa) yield strength steel; sizes as indicated. External coating per ASTM F 1043, Type A, minimum average 2.0 oz/ft² (610 g/m²) of zinc per ASTM A 123, or 4.0 oz/ft² (1220 g/m²) per ASTM A 525.

B. Steel square sections: [ASTM A 500, Grade B] Steel having minimum yield strength of 40,000 psi (275 MPa); sizes as indicated. Hot-dipped galvanized with minimum 1.8 oz/ft² (550 g/m²) of coated surface area.

C. PVC or polyolefin elastomer coated finish: In accordance with ASTM F1043, apply supplemental color coating of 10 to 15 mils (0.254 - 0.38 mm) thermally fused in Black color to match fabric.

D. End and Corner Post: 2"x2" sq. tube (0.095 wall thickness) with lbs/ft. strength.

E. Line (intermediate) Post Standard "C Post" (1.875" x 1.625") with 274 lbs/ft. strength.

F. Rail and Braces: Top Rail 1.625" x 1.25" C-channel with 263 lbs/ft strength.

2.4. ACCESSORIES

A. Chain link fence accessories: [ASTM F 626] Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match framing.

B. Post caps: Formed steel, cast malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. Provide tops to permit passage of top rail.

C. Top rail and brace rail ends: Pressed steel per ASTM F626, for connection of rail and brace to terminal posts.

D. Top rail sleeves: 7" (178 mm) expansion sleeve with spring, allowing for expansion and contraction of top rail.

E. Wire ties: 9 gauge [0.148" (3.76 mm)] galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge [0.092" (2.324 mm)] for rails and braces. Hog ring ties of 12-1/2 gauge [0.0985" (2.502 mm)] for attachment of fabric to tension wire.

F. Brace and tension (stretcher bar) bands: Pressed steel. At square post provide tension bar clips.

G. Tension (stretcher) bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) or equivalent fiber glass rod. Provide tension (stretcher) bars where chain link fabric meets terminal posts.

H. Tension wire: Thermally fused PVC or polyolefin elastomer applied to metallic coated steel wire: Per ASTM F 1664 Class 2 b, 7 gauge, [0.177" (4.5 mm)] diameter core wire with tensile strength of 75,000 psi (517 MPa).

I. Truss rods & tightener: Steel rods with minimum diameter of 5/16" (7.9 mm). Capable of withstanding a tension of minimum 2,000 lbs.

J. Nuts and bolts are galvanized but not vinyl coated. Color coat nuts and bolts with PVC touch up paint in color to match frame.

2.5 SETTING MATERIALS

A. Concrete: Minimum 28 day compressive strength of 3,000 psi.

B. Drive Anchors: Galvanized angles, ASTM A 36steel 1" x 1" x 30" galvanized shoe clamps to secure angles to posts.

PART 3 EXECUTION

3.1 EXAMINATION

A. General: Inspect Project for conditions which would prevent execution of work as specified. Do not proceed until such conditions have been corrected.
B. Verify areas to receive fencing are completed to final grades and elevations.
C. Ensure property lines and legal boundaries of work are clearly established.

3.2. GENERAL FENCE SYSTEM INSTALLATION

A. Install all work in accordance with the approved Shop Drawings.
B. Fence erection shall be plumb, straight, true and accurately fitted.
C. Work shall be adequately braced, reinforced, and anchored in place.

3.3. CHAIN LINK FENCE FRAMING INSTALLATION

A. Install chain link fence in accordance with ASTM F 567 and manufacturer's instructions.
B. Locate terminal post at each fence termination and change in horizontal or vertical direction of 30° or more.
C. Space line posts uniformly at 10' on center.
D. Concrete set terminal posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter 4 times greater than outside dimension of post, and depths approximately 6"(152 mm) deeper than post bottom or minimum 36" deep. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36" below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post. Slope to direct water away from posts. The top of footing shall be crowned for positive drainage.
E. Drive Anchor line posts: With protective cap, drive post 36" into ground. Slightly below ground level install drive anchor shoe fitting. Install 2 diagonal drive anchors and tighten in the shoe.
F. Check each post for vertical and top alignment, and maintain in position during placement and finishing operations.
G. Bracing: Install horizontal pipe brace at mid-height for fences 6' (1829 mm) and over, on each side of terminal posts. Firmly attach with fittings. Install diagonal truss rods at these points. Adjust truss rod, ensuring posts remain plumb.
H. Tension wire: Provide tension wire at bottom of fabric [and at top, if top rail is not specified]. Install tension wire before stretching fabric and attach to each post with ties.

Secure tension wire to fabric with 12-1/2 gauge [0.0985" (2.502 mm)] hog rings 24" (610 mm) oc.
I. Top rail: Install lengths, 21' (6400 mm). Connect joints with sleeves for rigid connections for expansion/contraction.
J. Center Rails (for fabric height 12' (3658 mm) and over). Install mid rails between posts with fittings and accessories.

K. Bottom Rails: Install bottom rails between posts with fittings and accessories.

3.4. CHAIN LINK FABRIC INSTALLATION

A. Fabric: Install fabric on project site side and attach so that fabric remains in tension after pulling force is released. Leave approximately 2" (50 mm) between finish grade and bottom selvage. Attach fabric with wire ties to line posts at 15" (381 mm) on center and to rails, braces, and tension wire at 24" (600 mm) on center.
B. Tension (stretcher) bars: Pull fabric taut; thread tension bar through fabric and attach to terminal posts with bands or clips spaced maximum of 15" (381 mm) on center.

3.5. ACCESSORIES

A. Tie wires: Bend ends of wire to minimize hazard to persons and clothing.
B. Fasteners: Install nuts on side of fence opposite fabric side for added security.

3.6. REPAIR OF DEFECTS

A. All defective or damaged work shall be replaced, removed and/or repaired directed by the City's Representative.
B. Restore adjacent finish grades which have been disturbed during work of this Section to their original condition.

3.7. CLEANUP

A. Upon completion of the work under this Section, the Contractor shall clean up debris and unused material, and remove all rubbish, waste and debris resulting from his operations from the site or as directed by the Owner's Authorized Representative. Remove all equipment and implements of service and leave the entire work area in a neat and clean condition as accepted by the City's Representative.

END OF SECTION 32 3113

SECTION 32 31 16 - ORNAMENTAL WELDED WIRE FENCE

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Decorative welded wire fencing, gates, and accessories.

1.2 RELATED SECTIONS

A. Section 312000 – Earthwork

B. Cast in Place Concrete

1.3 SYSTEM DESCRIPTION

A. The manufacturer shall supply a total ornamental welded wire fence system of the style, strength, size, and color defined herein. The system shall include all components as required, and shall be fabricated, coated, and assembled in the United States.

1.4 QUALITY ASSURANCE

A. The contractor shall provide laborers and supervisors who are familiar with the type of construction involved, and the materials and techniques specified.

B. Manufacturer of fence system must have five (5) years of documented experience in manufacturing the products specified in this section.

1.5 REFERENCES

A. ASTM A525 - Specification for General Requirements for Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process
B. ASTM A641 – Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
C. ASTM A185 – Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
D. ASTM D2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

1.6 SUBMITTALS

A. Manufacturer's submittal package, including shop drawings for fences and gates, shall be provided prior to installation. Prepare and submit dimensioned shop drawings detailing fencing and gate system, including property line or adjacent structures and layout of fences with dimensions, details, and finishes of components, accessories, and post foundations. Include critical dimensions and panel layout using modular grid. All dimensions shall be field verified.
B. Changes in specification may not be made after the bid date.
C. Samples of assembled materials, components, hardware, accessories, and/or colors, if requested.

D. Mock up: Prepare mock-up of the following:
   1. Fence panel with top/bottom rails and accessories attached to 2 posts in footings for both permanent and temporary fence.
   2. Gate attachment for permanent and temporary gate.
   3. Coordinate Landscape Architect and owner review of mockup-s for assembly and disassembly of temporary elements.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Upon receipt, materials should be checked for damage that may have occurred in shipping to the job site.
B. Each package shall bear the name of the manufacturer.
C. Store products in manufacturer's unopened packaging.
D. Store materials in a secure and dry area to protect against damage, weather, vandalism, and theft.
E. Transport, handle and store products with care to protect against damage before installation.

PART 2 – PRODUCTS

2.1 Manufacturers or equal: Subject to compliance with requirements.

A. The fencing system shall be Patriot Ornamental Wire Fence as manufactured by Jerith Manufacturing Co., Inc., 14400 McNulty Road, Philadelphia, PA 19154. Telephone: 800-344-2242; Fax: 215-676-9756; email: sales@jerith.com.
B. Fence height shall be 4' height & 6' height, 4 gauge wire, as noted in plans.
C. Gates shall have same wire mesh infill for gate panels
D. Color: Black.

2.2 MATERIALS

A. Structural Components: All posts and rails used in the fence system shall be manufactured from coil steel having a minimum yield strength of 55,000 psi. The steel shall be galvanized to meet the requirements of ASTM A525 with a zinc coating weight of 0.60-1.0 ounces per square foot.
B. Infill: Section infill wires shall be steel with a minimum yield strength of 50,000 psi. The steel shall be galvanized to meet the designation of "regular coating" in accordance with requirements of ASTM A641.

2.3 FINISH

A. Pretreatment: A five stage non-chrome pretreatment shall be applied. The final stage shall be a dry-in-place activator which produces a uniform chemical conversion coating for superior adhesion.
B. Coating: Fence materials shall be coated with a TGIC polyester powder-coat finish system. Epoxy powder coatings, baked enamel or acrylic paint finishes are not acceptable. The finish shall have a cured film thickness of at least 2.0 mils.
C. Tests: The cured finish shall meet the following requirements:
   1. Humidity resistance of 1,000 hours using ASTM D2247.
   2. Salt-spray resistance of 1,000 hours using ASTM B117.

3. Outdoor weathering shall show no adhesion loss, checking or crazing, with only slight fade and chalk when exposed for 3 years in Florida facing south at a 45 degree angle.

2.4 FABRICATION

A. Fence Sections shall be manufactured with 1" square x 18 gauge (.049) tubing welded every 12" to the top and bottom of welded wire panels. Welded wire panels shall be comprised of (.192") gauge for) vertical wires and 6 (.192") gauge horizontal wires. Verticals of 2 and 4 gauge wire shall be placed 3½" on center. 6 gauge verticals shall be placed on 1¾" centers. Horizontal wires shall be 6 gauge and spaced to provide style differences but no further apart than would allow substantial rigidity of vertical wires. Horizontal and vertical wires shall be assembled by automatic machines or other suitable mechanical means that will ensure accurate spacing and alignment of all members of the finished fabric. The wires shall be connected at every intersection by electric resistance welding in accordance with all requirements in ASTM A185. Sections shall be capable of supporting a 550 lb. load applied vertically at midspan and a concentrated load of 225 lbs. applied horizontally at midspan without permanent deformation.
B. Posts shall be 2" square x 16 gauge (.065") steel tubing. Posts shall be spaced 70" apart from inside face to face. Steel rail ends shall be screwed to terminal posts to receive the 1" square top and bottom rails. The rails shall be secured to the rail ends by stainless steel screws. Steel caps shall be provided with all posts.
C. Gates shall be assembled using panel material and gate ends with 1" or greater outside cross-section dimensions. Heavy-duty corner stampings shall be used to bolt each upright and rail intersection. All gates shall support a 300 lb. vertical load on the latch side of the gate without collapsing. Provide self-latching closure with opening for lock on inside of all gates. Gates shall be double gates, 10' clear with equal panels. Verify size of gate posts with gate weights.
D. Submit shop drawings of all gates for approval.

2.5 WARRANTY

A. The entire fence system shall have a written 8 Year Warranty against rust and defects in workmanship and materials. In addition, the finish shall be warranted not to crack, chip, peel, or blister for the same period.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify areas to receive fencing are completed to final grades and elevations.
B. Ensure property lines and legal boundaries are clearly established.
C. Remove any surface irregularities which may cause interference with the installation of the fence.

3.2 FENCE INSTALLATION

A. Install fence in accordance with the manufacturer's instructions.

B. Excavate post holes to proper depth to suit local conditions for stability and support of the fence system without disturbing the underlying materials. Excavate deeper as required for adequate support in soft and loose soils.
C. Set fence posts in concrete footers at 70" spacing from inside of post to inside of post. Note that this fence must be stepped for installations on a slope. It can not follow the grade.
D. Center and align posts in holes to required depth. Place concrete around posts and tamp for
consolidation. After tamping, check alignment of posts, and make necessary corrections before the concrete hardens.
E. Insert rail ends into horizontal rails and fasten in place to the posts.

3.3 GATE INSTALLATION

A. Set gate posts plumb and level for gate openings specified in construction drawings.
B. Install gates to allow full opening without interference after concrete has hardened around gate posts. Adjust hardware for smooth operation. Install one drop rod for double gates.
1.4 ACCESSORIES
1.5
A. Install post caps and other accessories to complete fence.

3.5 CLEANING

A. Contractor shall clean site of debris and excess materials. Post hole excavations shall be scattered uniformly away from posts.
B. If necessary, clean fence system with mild household detergent and clean water. Excess concrete must be removed from posts and other fencing material before it hardens.

END OF SECTION

SECTION 32 33 00 - SITE FURNISHINGS

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 site furnishings:

1. Picnic Tables
2. Pavilions

B. Related Sections include the following:

1. Division 00 Bidding requirements.
2. Division 01 General requirements.
3. Section 03300 "Cast-in-Place Concrete"

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM).

B. American Welding Society (AWS).

C. Forest Stewardship Council (FSC).

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, field-assembly requirements, and installation details.

B. Samples for Initial Selection: For units with factory-applied color finishes.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Size: Not less than 6-inch-long linear components and 12-inch square sheet components.
2. Manufacturer's Finishes for all powder coated finishes.

D. Material Certificates and warranties: For site furnishings, signed by manufacturers.

E. Maintenance Data: For site and street furnishings to include in maintenance manuals.

F. Shop Drawings: Provide plans, elevations, and sections showing site furnishing installation, attachments, materials, and finishes.

G. Submittal to include product data for:

1. Picnic Tables
2. Pavilions

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of site furnishings through one source from a single manufacturer.

PART 2– PRODUCTS

2.1 SEE SCHEDULE IN DRAWING SET FOR SPECIFIC PRODUCT INFORMATION.

PART 3– EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions, unless requirements that are more stringent are indicated. Complete field assembly of site furnishings, where required.

B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.

C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

D. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.

E. Posts Set into Voids in Concrete: Form or core-drill holes for installing posts in concrete to depth recommended in writing by manufacturer of site furnishings and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

F. Pipe Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with non-shrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, with top smoothed and shaped to shed water.

3.3 CLEANING

A. After completing site furnishing installation, inspect components. Remove spots, dirt, and debris. Repair damaged finishes to match original finish or replace component.

END OF SECTION 32 33 00

SECTION 32 80 00 - IRRIGATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes piping, valves, sprinklers, specialties, controls, and wiring for automatic-control irrigation system.

B. Related Sections include the following:

1. Section 32 9000 Landscaping.

1.2 DEFINITIONS

A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.

B. Drain Piping: Downstream from circuit-piping drain valves. Piping is not under pressure.

C. Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.

D. Following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. FRP: Fiberglass-reinforced plastic.
3. PA: Polyamide (nylon) plastic.
4. PE: Polyethylene plastic.
5. PP: Polypropylene plastic.
6. PTFE: Polytetrafluoroethylene plastic.
7. PVC: Polyvinyl chloride plastic.
8. TFE: Tetrafluoroethylene plastic.

1.3 PERFORMANCE REQUIREMENTS

A. Install 100 percent water-coverage irrigation system for lawns and exterior plants indicated.

B. Location of Sprinklers and Specialties: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent water coverage of turf and planting areas indicated.

C. Minimum Working Pressures: Following are minimum pressure requirements for piping, valves, and specialties, unless otherwise indicated:

1. Irrigation Main Piping: Schedule 40.
2. Circuit Piping: Class 200
3. Drain Piping: Class 200

1.4 SUBMITTALS

A. Product Data: Include pressure ratings, rated capacities, and settings of selected models for the following:

1. Water regulators.
2. General-duty valves.
3. Specialty valves.
4. Control-valve boxes.
5. Sprinklers.
6. Irrigation specialties.
7. Controllers. Include wiring diagrams.
8. Control cables. Include splice kits.

B. 'As built' Drawings: Changes in layout and/or arrangements of the proposed irrigation system, or other differences between proposed system and actual installed conditions are to be recorded by Contractor in form of "As-Built" Drawings. These drawings are to be clearly and neatly drawn on a mylar base of original design provided by Landscape Architect.

Show irrigation system piping, including plan layout, and locations, types, sizes, capacities, and flow characteristics of irrigation system piping components. Water meters, backflow preventers, valves, piping, sprinklers and devices, accessories, controls, and wire splice shall be shown with actual dimensions to reference points so they may be located easily in field. Show wire size and number of conductors for each control cable. Contractor will provide Owner and Landscape Architect with reproducible mylar copy of the "As-Built" Drawings before Work under this Contract will be considered for acceptance. Submittal of approved "As-Built" Drawings will preclude Application for Final Payment by Contractor.

C. Field quality-control test reports

D. Operation and Maintenance Data: For irrigation systems, to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include data for the following:

1. Automatic-control valves.
2. Sprinklers.
3. Controllers.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner/Construction Manager no fewer than 5 days in advance of proposed interruption of water service.

2. Do not proceed with interruption of water service without Owner/Construction Manager's written permission.

B. Irrigation system to operate under the following conditions:

1. Verify tap water supply to be minimum 40 gpm with not less than 75 psi prior to beginning work.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Refer to schedule on plans for specified heads.

1. Sprinkler Units: Equal to 10 percent of amount installed for each type and size indicated, but no fewer than 5 units.

2. Emitter Units: Equal to 10 percent of amount installed for each type indicated, but no fewer than 5 units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, following requirements apply to product selection:

1. Manufacturers or equal: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 PIPES, TUBES, AND FITTINGS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

B. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedule 40.

1. PVC Socket Fittings, Schedule 40: ASTM D 2466.

C. PVC Pipe: ASTM D 1785, PVC 1120 compound, Class 200.

1. PVC Socket Fittings, Class 200: ASTM D 2467.

2. PVC Threaded Fittings: ASTM D 2464.

D. PVC, Pressure-Rated Pipe: ASTM D 2241, PVC 1120 compound, SDR 21 and SDR 26.

1. PVC Socket Fittings, Schedule 80: ASTM D 2467.

E. Sleeving to be coordinated with General Contractor.

2.3 JOINING MATERIALS

A. Refer to Division 2 Section "Piped Utilities-- Basic Materials and Methods" for commonly used joining materials.

B. Bronze Gate Valves: MSS SP-80, Class 125, Type 1, nonrising-stem, bronze body with solid wedge, threaded ends, and malleable-iron handwheel.

1. Manufacturers or equal: Subjecto to compliance with requirements:

a. Crane Co.; Crane Valve Group; Crane Valves.

b. Stockham.

2.4 SPECIALTY VALVES

A. Plastic Automatic Control Valves: Molded-plastic body, normally closed, diaphragm type with manual flow adjustment, and operated by 24-V ac solenoid.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Hunter Industries Incorporated.

b. Rain Bird Sprinkler Mfg. Corp.

B. Automatic Drain Valves: Spring-loaded-ball type of corrosion-resistant construction and designed to open for drainage if line pressure drops below 2-1/2 to 3 psig. Install at low point for each lateral line “Rainbird 16AP” drain valve in gravel sump 12 inches by 12 inches in size with min. of 18 inches cover over sump.

C. Quick-Couplers: Factory-fabricated, bronze or brass, two-piece assembly. Include coupler water-seal valve; removable upper body with spring-loaded or weighted, rubber-covered cap; hose swivel with ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet; and operating key.

1. Locking-Top Option: Vandal-resistant, locking feature. Include two matching key(s).

2. Manufacturers or equal: Subject to compliance with requirements:

a. Rain Bird Sprinkler Mfg. Corp.

D. Isolation Valves:

1. Provide gate valves for isolation purposes allowing full diameter opening when in fully open position.
2. Manually operated valves shall be same size as mainline.

2.5 CONTROL-VALVE BOXES

A. Type 1- Plastic Control-Valve Boxes: Box and cover, with open bottom and openings for piping; designed for installing flush with grade. Include size as required for valves and service.

1. Shape: Round or Rectangular
2. Sidewall Material: PE, ABS, or FRP.
3. Cover Material: PE, ABS, FRP.
   a. Lettering: IRRIGATION.
4. Manufacturers or equal: Subject to compliance with requirements:
   a. Rainbird Irrigation Co.

B. Type 2– Polymer Concrete

1. Shape: Rectangular
2. Color: gray
3. Manufacturers or equal: Subject to compliance with requirements:
   a. Pentek

C. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3/4 inch minimum to 3 inches maximum.

2.6 PIPING SPECIALTIES

A. Water Regulators: ASSE 1003, single-seated, direct-operated, water-pressure regulators, rated for 150-psig minimum initial-inlet working pressure, with size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-pattern strainer that is compatible with unit for size and capacity.

1. NPS 2 and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 and Larger: Bronze or cast-iron body with flanged ends.
3. Interior Components: Corrosion-resistant materials.
4. Manufacturers or equal: Subject to compliance with requirements:
   a. FLOMATIC Corp.
   b. GA Industries, Inc.
   c. Watts Industries, Inc.; Water Products Div.
   d. Zurn Plumbing Products Group; Wilkins Operation.

B. Water Hammer Arresters: ASSE 1010 or PDI WH 201, with bellows or piston-type pressurized cushioning chamber and in sizes complying with PDI WH 201, Sizes A to F.

C. Pressure Gages: ASME B40.1. Include 4-1/2-inch diameter dial, dial range of 2 times system operating pressure, and bottom outlet.

2.7 SPRINKLERS

A. Description: Brass or plastic housing and corrosion-resistant interior parts designed for uniform coverage over entire spray area indicated, at available water pressure.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Hunter Industries Incorporated.

b. Rain Bird Sprinkler Mfg. Corp.

2. Pop-up, Spray Sprinklers: Fixed pattern, with screw-type flow adjustment and stainless-steel retraction spring.

3. Pop-up, Rotary, Spray Sprinklers: Gear drive, full-circle, and adjustable part-circle types.

4. Pop-up, Rotary, Impact Sprinklers: Impact drive, full-circle, and part-circle types.

2.8 SPRINKLER SPECIALTIES

A. Application Pressure Regulators: Brass or plastic housing, NPS 3/4 with corrosion-resistant internal parts, and capable of controlling outlet pressure to approximately 20 psig.

B. Strainer/Filter Units: Brass or plastic housing, with corrosion-resistant internal parts; of size and capacity required for devices downstream from unit.

C. Emitters: PE or vinyl body.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Rain Bird Sprinkler Mfg. Corp.

2. Single-Outlet Emitters: To deliver the following flow at approximately 20 psig (138 kPa):

a. Flow: 1 gph

b. Tubing Size: 1/8-inch minimum ID and 10 feet long.

3. Multiple-Outlet Emitters: With at least 6 outlets, to deliver the following flow at approximately 20 psig:

a. Flow at Each Outlet: 1 gph

b. Tubing Size: 1/8-inch minimum ID and 60 feet long.

4. Outlet Caps: Plastic, for outlets without tubing.

D. Drip Tubes: NPS 1/2, NPS 3/4, NPS 1, flexible PE or PVC tubing for emitters and other devices, of length indicated and with plugged end.

1. Manufacturers or equal: Subject to compliance with requirements:

a. Rain Bird Sprinkler Mfg. Corp.

2.9 AUTOMATIC-CONTROL SYSTEM

A. Manufacturers or equal: Subject to compliance with requirements:

1. Hunter Industries Incorporated.

2. Rain Bird Sprinkler Mfg. Corp.

B. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.

1. Material: Molded plastic.

2. Mounting: Surface type for wall mounting.

C. Control Transformer: 24-V secondary, with primary fuse.

D. Controller Stations for Automatic Control Valves: Each station is variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each station.

E. Timing Device: Adjustable, 24-hour, 14-day clock, with automatic operations to skip operation any day in timer period, to operate every other day, or to operate 2 or more times daily. Automatic Controller is to be installed in the location schematically shown on drawings but identified by owner's representative in the field. The controller location will be accessible as shown on drawing for maintenance. Provide for the possibility of making minor timing adjustments to the controller in the field.

1. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.

2. Nickel-Cadmium Battery and Trickle Charger: Automatically powers timing device during power outages.

3. Surge Protection: Metal-oxide-varistor type on each station and primary power.

F. Wiring: UL 493, Type UF-B multiconductor, with solid-copper conductors and insulated cable; suitable for direct burial. Power to controller to be provided by General Contractor.

1. Manufacturers or equal: Subject to compliance with requirements:

a. AFC Cable Systems Inc.

b. Alcatel Canada Wire, Inc.

c. American Electric Cable Co.

d. American Insulated Wire Corp.

e. Cerro Wire & Cable Co., Inc.

f. Colonial Wire and Cable Co., Inc.

g. Essex Group, Inc.; Building Wire Products Division.

h. Precision Cable Manufacturing Co., Inc.

i. Southwire Company.

j. Triangle Wire and Cable Co.

2. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.

3. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.

4. Splicing Materials: Manufacturer's packaged kit consisting of insulating, spring-type connector, or crimped joint and epoxy resin moisture seal; suitable for direct burial.

G. Concrete Base: Reinforced precast concrete with opening for wiring.

2.10 PRESSURE REGULATOR

A. Provide Wilkins #600. Install outside of building for easy access and adjustment.

B. Mastervalve: Rainbird # electric remote control valve w/ brass body and bonnet. Valve shall be wired to open and close with each circuit valve. Size based on mainline.

2.11 HOSE BIBS

A. Hose bibs shall have an all-cast brass or bronze body. Hose bibs to be ¾ inch inside diameter and shall be installed below grade in Rainbird 12 inch by 18-inch valve boxes. Cover over hose bib boxes shall be clearly marked with "non-potable water".

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

B. Install warning tape directly above pressure piping, 12 inches below finished grades, except 6 inches below subgrade under pavement and slabs.

C. Install piping and wiring in sleeves under sidewalks, roadways, parking lots, and railroads.

1. Install piping sleeves by boring or jacking under existing paving if possible.

D. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded from 12 inches below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with excavated material.

E. Provide minimum cover over top of underground piping according to the following:

1. Irrigation Main Piping: Minimum depth of 18 inches below finished grade, or not less than 15 inches below average local frost depth, whichever is deeper.

2. Circuit Piping: 12 inches.

3. Drain Piping: 12 inches.

4. Sleeves: 24 inches.

3.2 PREPARATION

A. Set stakes to identify locations of proposed irrigation system. Obtain Landscape Architect's approval before excavation.

3.3 PIPING APPLICATIONS

A. Install components having pressure rating equal to or greater than system operating pressure.

B. Piping in control-valve boxes and aboveground may be joined with flanges instead of joints indicated.

C. Aboveground Irrigation Main Piping: Use the following piping materials for each size range:

1. NPS 5 and Larger: Schedule 80, PVC pipe and socket fittings; and solvent-cemented joints.
2. NPS 5 and Larger: Schedule 80, PVC pipe; Schedule 80, threaded, PVC fittings; and threaded joints.

D. Underground Irrigation Main Piping: Use one of the following piping materials for each size range:

1. NPS 4 and Smaller: Schedule 40 PVC pipe and socket fittings, and solvent-cemented joints.
2. NPS 4 and Smaller: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.

E. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80, PVC pipe; threaded PVC fittings; and threaded joints.

1. Option: Plastic piping manufactured for this application may be used instead of pipe and fittings specified.

F. Risers to Aboveground Sprinklers and Specialties: Schedule 80, PVC pipe and socket fittings; and solvent-cemented joints.

G. Drain Piping: Use the following piping materials:

1. Sizes: Schedule 40, PVC pipe and socket fittings; and solvent-cemented joints.
2. Sizes: SDR 21, 26, or 32.5, PVC, pressure-rated pipe; Schedule 40, PVC socket fittings; and solvent-cemented joints.
3. Sizes: SIDR 9, 11.5, or 15, PE, controlled ID pipe; insert fittings for PE pipe; and banded or coupled joints.

H. Sleeves: Schedule 40 PVC pipe and socket fittings; and solvent-cemented joints.

3.4 VALVE APPLICATIONS

A. Aboveground, Shutoff-Duty Valves:

1. NPS 2 and Smaller: Bronze ball valve.

B. Underground, Shutoff-Duty Valves: Use the following:

1. NPS 2 and Smaller: Curb stop with tee head, curb-stop service box, and shutoff rod.
2. NPS 3 and Larger: AWWA cast-iron gate valve with elastomeric gaskets and stem nut, valve box, and shutoff rod.

C. Underground, Manual Control Valves: Bronze globe valve with control-valve box and valve key.

D. Control Valves:

1. Plastic by Rainbird

E. Drain Valves:

1. Bronze- Automatic drain valve.

3.5 PIPING INSTALLATION

A. Location and Arrangement: Drawings indicate location and arrangement of piping systems. Install piping as indicated unless deviations are approved on Coordination Drawings.

B. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.

C. Install piping free of sags and bends.

D. Install groups of pipes parallel to each other, spaced to permit valve servicing.

E. Install fittings for changes in direction and branch connections.

F. Install unions adjacent to valves and to final connections to other components with NPS 2 or smaller pipe connection.

G. Install flanges adjacent to valves and to final connections to other components with NPS 2-1/2 or larger pipe connection.

H. Install dielectric fittings to connect piping of dissimilar metals.

I. Install underground thermoplastic piping according to ASTM D 2774.

J. Lay piping on solid subbase, uniformly sloped without humps or depressions.

K. Install ductile-iron piping according to AWWA C600.

L. Install PVC piping in dry weather when temperature is above 40 deg F 5 deg C. Allow joints to cure at least 24 hours at temperatures above 40 deg F 5 deg C before testing unless otherwise recommended by manufacturer.

M. Install water regulators with shutoff valve and strainer on inlet and pressure gage on outlet. Install shutoff valve on outlet.

N. Water Hammer Arresters: Install between connection to building main and circuit valves in valve box.

3.6 JOINT CONSTRUCTION

A. Refer to Division 2 Section "Piped Utilities-- Basic Materials and Methods" for basic pipe joint construction.

3.7 VALVE INSTALLATION

A. Underground Gate Valves: Install in valve box with top flush with grade.

1. Install valves and PVC pipe with restrained, gasketed joints.

B. Underground Curb Stops: Install in service box with top flush with grade.

C. Underground, Manual Control Valves: Install in manual control-valve box.

D. Control Valves: Install in control-valve box.

E. Drain Valves: Install in control-valve box.

3.8 SPRINKLER INSTALLATION

A. Flush circuit piping with full head of water and install sprinklers after hydrostatic test is completed.

B. Install sprinklers at manufacturer's recommended heights.

C. Locate part-circle sprinklers to maintain minimum distance of 4 inches from walls and 2 inches from other boundaries, unless otherwise indicated.

3.9 AUTOMATIC-CONTROL SYSTEM INSTALLATION

A. Install freestanding controllers on precast concrete bases not less than 36 by 24 by 4 inches thick, and not less than 6 inches greater in each direction than overall dimensions of controller.

B. Install control cable in same trench as irrigation piping and at least 2 inches below piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas if irrigation piping is installed in sleeve.

3.10 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

C. Connect wiring according to Division 16 Section "Conductors and Cables."

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.11 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplates and signs on each automatic controller.

1. Text: In addition to identifying unit, distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

B. Refer to Division 2 Section "Piped Utilities-- Basic Materials and Methods" for equipment nameplates and signs.

C. Warning Tapes: Arrange for installation of continuous, underground, detectable warning tape over underground piping, during backfilling of trenches.

D. Refer to Division 2 Section "Earthwork" for warning tapes.

3.12 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace units and reinspect as specified above.

3.13 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Verify that controllers are installed and connected according to the Contract Documents.

C. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 16 Sections.

D. Complete startup checks according to manufacturer's written instructions.

E. Set initial watering schedules and programming on automatic controllers at the direction of Landscape Architect. Changes in schedules and programming and instructions on how to make such changes is the responsibility of Landscape Contractor.

3.14 ADJUSTING

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.

C. Adjust sprinklers so they will be flush with, or not more than 1/2 inch above, finish grade.

3.15 WINTERIZING THE SYSTEM

A. Irrigation piping must be winterized by first blowing system clear of water using compressed air (80 psi minimum) admitted into piping at quick coupling valve or hose bib located at higher elevation on system piping. Activate individual zones, higher zones first, then proceed successively through system towards lower elevations. Proceed through all zones twice. Air compressor used to winterize system must have engine separate from compressor tanks to prevent high temperature air from being injected directly into PVC piping.

3.16 CLEANING

A. Flush dirt and debris from piping before installing sprinklers and other devices.

3.17 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controller and automatic control valves. Refer to Division 1 Section "Closeout Procedures- Demonstration and Training."

3.18 ACCEPTANCE AND GUARANTEE

A. Substantial Completion: Submit written requests for inspection for Substantial

Completion to Landscape Architect at least three calendar days prior to anticipated Date of Inspection and Testing. Substantial Completion cannot be granted and at the same time no further applications for payment shall be approved for more than 85 percent of contract until there has first been a walk-thru for head coverage at which time a "punch list" will be written consisting of items to be addressed and corrected by Contractor immediately. Depending on extent of Work on "punch list", Landscape Architect will determine job to be Substantially Complete or pending completion of "punch list".

B. Submit four copies record drawings and maintenance manuals to Landscape Architect with written request for inspection.

C. Review "punch list" Work jointly with Owner and Landscape Architect for Substantial Completion of total contract Work.

D. Upon satisfactory completion of repairs and replacements and completion of "As – Built" Drawings, Landscape Architect and Owner will verify system for Substantial Completion and issue AIA Certificate of Substantial Completion if all items on "punch list" have been completed. If necessary, another "punch list" will be written to itemize any deficiencies still existing and will be attached to AIA Certificate. Contractor shall complete all "punch list" items, if possible, within 30 days while continuing maintenance.

3.19 GUARANTEE

A. Work, products, equipment, and materials for one year, beginning at Date of Substantial Completion as per written letter of notification.

B. Make good damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to Owner.

C. Repair damage to grade, plants and other Work or property as necessary.

D. If replacements are not acceptable during or at end of Guarantee Period, Owner may elect either subsequent replacement or credit. Replacement products shall have similar one-year guarantee from time of replacement.

E. Guarantee applies to unacceptable conditions or losses with exception of Master Irrigation Specifications.

END OF SECTION

SECTION 32 90 00 – LANDSCAPING

PART 1- GENERAL

1.1 SUMMARY

A. Extent of planting is shown on drawings and in schedules.

B. Provide labor, materials, and equipment required by or reference from drawings and specifications to complete work of this section.

C. Verify plant count from plan and provide and install plant material on plan.

D. Plants shall conform to or surpass minimum quality standards as defined by American Association of Nurserymen, current edition of American Standards for Nursery Stock published by American Association of Nurserymen, Inc. in addition shall conform to sizes and descriptions in plant list.

1.2 APPROVAL AND SELECTION OF MATERIALS AND WORK

A. Selection of materials and execution of operations required under Drawings and Specifications is subject to approval of Owner and Landscape Architect. They have the right to reject materials work, which in their opinion, does not meet requirements of Contract Documents at any stage of operations. Remove rejected Work and or materials from Project Site. Replace promptly at no additional cost to Owner.

1.3 QUALITY ASSURANCE

A. Landscape Contractor shall be qualified with work resulting in successful plant establishment.

B. Landscape Contractor is required to maintain an experienced full-time supervisor on project site when planting is in progress.

C. Following codes and standards shall be observed:

1. Florida Department of Transportation (FDOT) Standard Specifications for Highway Construction, current edition.
2. State and Federal laws, including for disease and insect control.
3. Requirements of authorities having jurisdiction.

D. A Pre-installation Conference shall be conducted at project prior to start of work.

1.4 WORKMANSHIP

A. Install plant materials neatly.

B. Make minor adjustments to layout as may be required and requested by Landscape Architect at no additional cost to Owner.

C. Coordinate delivery of plant material with time of installation to prevent plant material from being stockpiled on site longer than 24 hours.

D. Deliver materials in such manner as to not damage or decrease health and vigor of plant materials. Store materials away from detrimental elements. Coordinate with General Contractor to secure a safe staging area.

E. Handle, load, unload, and transport materials carefully to avoid damage.

F. Maintain and protect plant materials as necessary to insure health and vigor.

1.5 GUARANTEE

A. Guarantee plant materials and lawn areas for one year from date of substantial completion. Landscape Contractor shall replace plants that fail to grow properly with plants as originally specified at the earliest practical date following plant failure, without additional charges to Owner.

B. Replacement materials will be guaranteed for one year from the date of replacement.

C. Landscape Contractor shall not be responsible for replacing plants which are damaged by abuse or improper maintenance by Owner as reported by Landscape Contractor outlined below or by acts of nature occurring after acceptance.

D. Acts of nature may include but may not be limited to high winds of hurricane or tornado force, sleet, hail, freezing rain, plants washed away in 50 year or greater rainstorms in the first month of installation, and extreme cold (as determined by the Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at twenty percent less than the original contract price for the damaged work.

1.6 CONTRACTOR'S PERIODIC INSPECTION

A. During guarantee period, Contractor shall make periodic inspections of the project to satisfy himself that maintenance by Owner is adequate.

B. Methods or products which he deems not normal or detrimental to good plant growth shall be reported to Owner in writing.

C. Failure to inspect and report shall be interpreted as approval and Landscape Contractor shall be held responsible for replacements.

1.7 SOIL TESTING

A. Landscape Contractor shall have soil tested by suitable laboratory chosen by Landscape Contractor and subject to written approval of Landscape Architect. Topsoil analysis shall state percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ration; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

B. Soil test shall be completed in planting areas to determine lime and fertilizer requirements. Submit test results to Landscape Architect for approval. Landscape Contractor shall adjust pH and fertility based upon results. No addition to or placement of soil is to be conducted prior to initial soil test report approval.

C. Report of suitability of topsoil shall be furnished for lawn growth stating recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

PART 2- PRODUCTS

2.1 TOPSOIL

A. Topsoil shall be fertile, friable, sandy loam and a natural surface soil obtained from well areas reviewed by Landscape Architect and possessing characteristics of representative soils in project vicinity that produce heavy growths of crops, grass, or other vegetation.

B. Topsoil shall be free of subsoil, brush, organic litter, or objectionable weeds, clay, clots, stumps, stones, roots, or other material harmful to plant growths or hindrance to planting or maintenance operations. Should regenerative materials be present in soil, Landscape Contractor shall eradicate and remove such growth, both surface and root, which may appear in imported material within one year following acceptance of work.

C. Topsoil shall not be handled in a frozen muddy condition. Acidity range shall be between 5.0 and 7.0 inclusive. Mechanical analysis of soil shall be as follows:

Sieve Size	Percent Passing
1 inch mesh	99 - 100 percent
1/4-inch mesh	97 - 99 percent
No. 100 mesh	40 - 60 percent
No. 200 mesh	20 - 40 percent

D. Landscape Contractor to spread 4" of topsoil in all sod locations, 12" of topsoil in all planting beds, and depth per details of lightweight planting mix in all raised planters. Landscape Contractor will be responsible for fine grading. Topsoil, regardless of source, shall meet requirements of paragraph above.

E. Stockpiled material that does not meet requirements may, at the option of Landscape Contractor, be improved by screening and addition of organic matter and chemical admixtures.

2.2 PLANTING SOIL MIXTURE

A. Provide soil mix amended as per laboratory recommendations. Basic planting soil mix consists of:

50 percent topsoil (as described above)

50 percent prepared additives (by volume as follows)

3 parts humus (forest peat) or "Nature's Helper" by Klum

1-part sterilized cow manure, commercial fertilizer, and lime as recommended in soil analysis

B. Components shall be thoroughly mixed to uniform consistency by hand or machine methods.

2.3 TREES

A. Large deciduous shade trees and ornamental trees are to be field grown from rooted cuttings true to variety and not grafted material. No grafted material will be accepted for initial installation or as guarantee replacement material.

B. Balled and burlapped plant materials are to be wrapped with organic wrapping burlap only. Synthetic material will not be accepted. Remove nursery loading straps once plant material is placed in pit.

2.4 PLANTS

A. Plants shall conform to or surpass minimum quality standards as defined by American Association of Nurserymen (AAN), current edition of American Standard for Nursery Stock, published by the AAN, Inc. and in addition, shall conform to sizes and descriptions in plant list

B. Balled and burlapped plant materials are to be wrapped with organic wrapping burlap only. Synthetic material will not be accepted. Remove nursery loading straps once plant material is placed in pit.

2.5 ORDERS FOR PLANT MATERIALS

A. Submit to Landscape Architect within 30 days from date of contract is awarded to General contractor confirmed orders for material from approved growers (listed on plant schedule). Contractor is responsible for payment of deposits required by approved growers.

B. Necessary inspection certificates shall be supplied to Landscape Architect's representative for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with Landscape Architect prior to acceptance of material.

2.6 INSPECTION & QUALITY

A. Plant materials shall be subject to inspection and approval. Landscape Architect reserves the right to reject plants which fail to meet this specification at any point during the installation of job. Rejected materials shall be promptly removed from site by Landscape Contractor at no additional cost to the owner.

C. Plant materials furnished shall be well branched, proportioned width to height, of normal habit, sound, healthy and vigorous in growth. Minimum acceptable sizes of plants shall be measured before pruning with branches in normal position and shall conform to measurements specified. Plants used where symmetry is required shall be matched as closely as possible. Plants shall meet requirements as listed in plant list.

D. Plants shall be of healthy stock, free from disease, insects, eggs, larvae, and parasites of an objectionable or damaging nature.

2.7 SOURCE OF PLANTS

A. Plants shall be field nursery, container grown or collected material subject to requirements of Specifications.

B. Orders for Plant Materials- Submit to Landscape Architect within 30 days from date contract is awarded to Landscape Contractor confirmed orders for materials from approved growers. Landscape Contractor is responsible for payment of deposits required by approved growers. Contractor is required to provide pictures of trees with orders. Pictures shall adequately show character, form, height, spread and caliper.

C. All necessary inspection certificates shall be supplied to the Landscape Architect's representative for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with Landscape Architect prior to acceptance of the material.

D. Alternate Growers- Alternate growers will be considered by the Landscape Architect only if submitted prior to bidding. The Landscape Architect will select and tag 100% of plant materials from acceptable alternate growers. The Contractor will be responsible for all expenses related to tagging trips to alternate growers including usual fees charged by the Landscape Architect. The Contractor shall arrange for and provide transportation for the Landscape Architect. Contractor shall provide the Landscape Architect a minimum of three weeks advance notice. Contractor shall limit tagging trips to no more than two at

a maximum of two days each. All tagging trips will be completed within 45 days from date contract is awarded to General Contractor.

E. Contractor will submit confirmed orders from acceptable alternate growers within ten days of tagging by the Landscape Architect. Contractor is responsible for payment of deposits required by acceptable alternate growers.

F. All trees (except Pines) are to be located by the Contractor at one of the approved nurseries listed, or equal as approved by the Landscape Architect. The Contractor should anticipate accompanying the Landscape Architect on the tagging trips but is not required to do so. Nurseries of equal quality must be approved prior to bidding.

G. Tree Nurseries or equal: Subject to compliance with requirements:

1. Bold Springs Nursery
   3920 Bold Springs RD. Monroe, GA 30655
   P: (770) 267-9196 F: (770) 267-8803
2. Ray Bracken Nursery, INC.
   815 Bracken Road Piedmont, SC 29673
   P: (800) 992-4321 F: (803) 227-1906
3. Charlies Creek Nursery
   P.O. Box 669 Iva, SC 29655
   P: (864) 348-7489 F: (864) 348-6486
4. Cherry Lake
   7836 Cherry Lake Road Groveland, FL 34736
   P: (352) 429-2171
5. Green Valley Nursery
   12975 HWY. 17 Montevallo, AL 35115
   P: (205) 665-1355 F: (205) 665-1313
6. Hawkersmith & Sons Nursery
   950 Hawkersmith Road Tullahoma, TN 37388-9204
   P: (931) 455-5436 F: (931) 455-3643
7. Hunter Trees, LLC
   P.O. Box 382733 Birmingham, AL 35238-2733
   P: (205) 296-6401
8. Moon's Tree Farm
   6327 HWY 20 Loganville, GA 30052
   P: (770) 554-6849 F: (770) 554-6852
9. Plantation Tree Company
   120 County Road 15 South Selma, AL 36703
   P: (800) 848-5064 F: (334) 872-9621
10. Select Trees
    P.O. Box 6671 Athens, GA 30604
    P: (706) 769-9879 F: (706) 769-4528
11. Green Ridge Tree Farm, LLC
    11907 County Road 117 Eutaw, AL 35462

P: (205)372-0205 F: (205) 372-4087

H. Nurseries or equal for perennials and native grasses:

1. Emerald Coast Growers
   7410 Klondike Road Pensacola, FL 32526
   P: (850) 944-0808 F: (850) 944-1006
2. Petals From the Past
   16034 County Road 24 Jemison, AL 35085
   P: (205) 646-0069

2.8 SOD

A. Sod shall be 100% specified grass, free of weeds, freshly dug.

2.9 GUYING & STAKING

A. Stakes for supporting trees shall be sound timber, straight, sized as shown in planting details and of sufficient length to adequately support plant. Visible surfaces shall be painted flat black.

B. Deadman or stakes for anchoring guy wires in ground shall be of size, material, and strength adequate to hold guy taut and maintain tree firmly in an upright position.

C. Wire shall be #12-gauge galvanized wire in double twisted strand to adjust tension.

2.10 FERTILIZER

A. Fertilizer for trees, plants and ground covers shall be Milorganite, or approved equal delivered to site in unopened containers.

B. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to site in original, unopened container, bearing Manufacturer's guaranteed analysis. Fertilizer shall not have been exposed to weather prior to delivery to site. After delivery until used, it shall be completely protected at all times. It shall not be stored in direct contact with ground.

C. Fertilize areas according to manufacturer's recommended rates in accordance with monthly maintenance guideline herein.

D. Cultivate and water beds or pits thoroughly after application.

E. Adjust fertilizer in accordance with interim soil test reports.

2.11 MULCH

A. Mulch shall be clean, fresh, free of noxious weed, seed, fire ants, Japanese beetles and/or fringed beetles.

B. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, or one of following:

1. All Planted Areas: 100 percent shredded pine bark free of extraneous and deleterious matter.
2. Class A hay or straw mulch for seeding per AHD Section 860.03.

2.12 LIME

A. Ground dolomitic limestone not less than 85 percent total carbonates and magnesium, ground so that 50 percent passes 100-mesh sieve and 90 percent 20-mesh sieve.

PART 3 – EXECUTION

3.1 LAYOUT OF MAJOR PLANTS

A. Before commencing planting operations, location of major plants and outlines of areas to be planted shall be marked out on ground by Landscape Contractor, for approval by Landscape Architect. Contact Landscape Architect a minimum of 48 hours in advance of anticipated review of layout.

3.2 TIME AND PLANTING

A. Planting operations shall be during favorable weather in which conditions are neither extremely cold or hot nor to point that the risk of loss is too great. Landscape Contractor shall inform Landscape Architect of high risks due to weather.

3.3 PREPARATION OF PLANTING BEDS

A. Grade will be brought to a level of 6 inches below finished grade by General Contractor. Subgrade shall consist of a minimum of 4-foot depth of native soil. Landscape Contractor will spread 6 inches of topsoil, fine grading all planting beds to finish grade. This is to include debris removal and any grading required to bring landscaping finished grade to proper level for planting trees, shrubs and ground covers. Landscape Contractor shall grade for proper drainage. Areas shall have smooth and continual grade between the existing and fixed controls such as walks and curbs. Finished grades shall meet approval of Landscape Architect before planting operations begin.

B. Circular plant pits with vertical sides shall be dug by hand or machine methods for planting and transplanting of trees and shrubs.

C. Shrub pit diameter shall be a minimum of one foot greater than spread of root mass.

D. Transplanted material is to be replanted same day it is dug or properly healed in and watered regularly to insure life.

E. Test excavated plant pits to determine if sufficient drainage is present for proper plant survival.

F. Fill area between pits, if individual pits are arranged in a group, to required grade with specified mulch, 3 inch deep. Plant beds shall be neatly edged and kept free of weeds until work is accepted.

3.4 EXCAVATION FOR PLANTING GROUND COVERS

A. Ground cover beds shall be scarified by hand or machine method to a minimum depth of 8 inches. Four inches of pine bark additive and 20 pounds per 1000 square feet of fertilizer shall be uniformly incorporated into soil to full 8" of minimum depth.

3.5 DRAINAGE TEST

A. Tree pits shall be filled with water. If percolation is less than 100 percent within a period of twelve hours, drill a 12-inch auger to a depth of 4' below bottom of pit. Retest pit. In case drainage is still unsatisfactory, notify Landscape Architect in writing of condition before planting trees. Landscape Contractor is fully responsible for warranty of trees. If tree is on slope provide trench filled with stone and 4" drainpipe to point of nearest relief.

B. Drainage Test for Plants and Ground Covers shall be spot tested to insure proper percolation.

C. Balled and container plants shall be placed firmly upon scarified subgrade and backfilled with planting soil mixture. Remove wire, cords, and burlap from top of root ball. Hand tamp carefully around and under ball to fill all voids. Water during back filling. Form saucer from planting soil mixture in order to retain water.

D. Gently loosen outer roots of container grown plants to encourage outward growth.

E. Fertilizer shall be thoroughly mixed and soaked into top 2 inch of soil for plant pits.

3.6 TREE TRANSPORTATION

A. Landscape Contractor shall be responsible not only for safe transportation of plants to site but also their condition upon arrival. Trees with abrasions to bark, sun scalds, fresh cuts, or breaks of limbs which have not completely callused will be rejected. Trees which have been damaged during transit will be replaced by Landscape Contractor at no additional cost. Unit costs per plant will reflect above listed specifications.

3.7 TREE TAGS

A. Plants accepted at the nursery by Landscape Architect shall be tagged with serialized self-locking tags. Trees delivered to site without these tags or with broken Tags will be rejected. The tags shall remain on trees until Landscape Contractor has been given instructions by Landscape Architect for removal.

3.8 PRUNING DECIDUOUS TREES

A. Deciduous trees and shrubs shall be pruned only to thin out heavy growth.

B. Do not top or remove terminal growing point or leader of plant.

3.9 GUY TREES 2" CALIPER AND OVER

A. Space three guys equally about each tree, attached at approximately two-fifths up trunk. Guys should be at 45-degree angles and anchored in ground with stakes. Guy to trunks with wire loops and black rubber hose drawn snug in all Directions. These guys shall be equally taut. Stakes to be painted black with nonleaded outdoor paint.

B. Stake trees less than 2-inch caliper with two wood stakes driven two feet into ground with portion extending above ground approximately 1/2 of trunk height. Stake one foot from trunk, fastened at approximately two-fifths of trunk height with wire run through rubber hose. Stakes to be painted black with black nonleaded outdoor paint.

3.10 MULCH

A. Mulch planting beds and other areas designated to be mulched, with three "settled" inches of specified mulch. Individual plants are to be mulched as detailed. Mulch is to be measured after settlement and maintained as specified.

3.11 REMOVAL OF EXISTING GRASS

A. Landscape Contractor is to remove existing grass and weeds from all areas for planting and resodding as designated on plans. Existing stands are to be removed to a maximum depth of 1 inch so to not disturb existing tree roots where present in those areas.

B. Aerate with a tined tiller to break up upper 3 inches lightly not to damage tree roots. Pick up solids for discarding and cut cleanly any roots damaged.

C. Spread a light layer of topsoil not more than 1 inch in depth over aerated area and fine grade to meet acceptance by Landscape Architect. Apply fertilizer and lime to these areas as specified previously under "Preparation of Planting Beds" or "Preparation of Sod or Seed Areas", which ever the case may be.

3.12 PREPARATION OF SOD AREAS

A. Grade will be brought to a level of 4" below finished grade by the General Contractor. Subgrade shall consist of a minimum of 4-foot depth of native soil. The landscape contractor will spread 4" of topsoil, fine grading all lawn areas to finish grade. All areas shall have smooth and continual grade between the existing and fixed controls such as walks and curbs. Contractor shall fine grade as necessary for uniformity and drainage. Roll, scarify, rake and level as necessary to obtain true, even, and firm lawn surfaces. All finished grades shall meet approval of the Landscape Architect before sod or seeding operations begin.

B. On this grade, spread specified fertilizer as per Manufacturer's recommendations and lime at a rate of 50 lbs. per 1000 square feet evenly over all areas to receive grass. A soil test shall be made prior to the beginning of fertilizing and liming and the quantities of the lime and fertilizer shall be adjusted, if necessary, to achieve a pH of 6.0 to 7.0.

C. Scarify prepared grade to depth of 6 inches, thoroughly incorporating fertilizer and lime into the top 6" of existing soil in all areas to be grassed. Caution shall be exercised to avoid damage to underground utilities. All building debris, vegetation, sticks and stones over 1 inch in any dimension shall be removed and the surface leveled and smoothed.

3.13 SODDING OPERATIONS

A. Delivery of sod shall be scheduled so to allow laying of sod without delay. No sod shall remain stacked longer than 24 hours. In the event that sod cannot be laid immediately upon delivery, Contractor shall lay sod on as designated site, to be approved by the Landscape Architect. No sod shall overlap, and it shall be lightly watered as necessary to keep moist.

B. Lay sod when bed is not excessively wet or frozen, but when soil is moist for a depth of 4".

C. Lay sod so that no voids occur. Sod shall be tamped and rolled by hand methods. The completed surface shall be true to finish grade and even and firm at all points.

D. Do not move heavy objects over areas to be sod after the soil has been prepared.

E. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur.

F. Areas determined by the Landscape Architect to be solid rock will be exempt from this requirement.

3.14 CLEANUP AND PROTECTION

A. Keep Project Site clean and orderly during planting operations.

B. Clear grounds of debris, superfluous materials, and all equipment upon completion of Work. Remove from site to satisfaction of Landscape Architect and Owner.

C. Protect all work and materials from damage due to landscape operations and operations by other contractors, trades, and trespassers. Maintain protection until Date of Substantial Completion.

D. Contractor is responsible for theft of equipment and material at the site before, during and after installation, until Date of Substantial Completion of Work in total.

3.15 LANDSCAPE MAINTENANCE

A. SUMMARY

1. Begin maintenance at commencement of Work of this Section and Continue until Substantial Completion, as part of Work of this section.
2. Continue maintenance for a Maintenance Period of 30 days after date of Substantial Completion.
3. Provide labor, materials, equipment and means for proper maintenance of all materials and workmanship.

B. SUPERVISION

1. Submit a written report and conduct joint inspection with Landscape Architect of maintenance program and procedures, at inspection for Substantial Completion.

C. MAINTENANCE OF TREES, SHRUBS, SOD AND SEED

1. Maintain plants in a growing, well formed, healthy condition by watering, fertilizing, pruning, weeding, spraying, wrapping, straightening, replacement or by other necessary maintenance operations.

D. WATERING

1. Monitor owner's automatic watering system and schedule for proper watering of plant material.
2. Advise Landscape Architect immediately in writing of recommended alterations due to weather or other conditions.
3. Water landscaped areas not covered by automatic watering system as frequently as necessary to maintain proper moisture level, using following schedule as a guide:
    a. Twice a month during March, April, May
    b. Once a month during June, July, August, September
    c. No watering from October through February, except in drought conditions.

E. FERTILIZING

1. Apply four (4) times a year to trees, shrubs, ground cover, and sod as per manufacturer's recommended application rate.

F. MOWING

1. Mow grass to a height of 2 to 2.5 inches when it reaches a height of 3 inches, or as directed by Landscape Architect. Sodded lawns shall have at least one mowing before receiving Substantial Completion.

G. SITE ANNUAL PLANTING

1. Replace annual plantings according to schedule in Drawings. Blooming plants shall be replaced as necessary throughout specified Maintenance Period to maintain blooming condition.

H. PRUNNING

1. Remove dead wood as it becomes evident. Remove living portions of plants only at direction of Landscape Architect.

I. WILT-PROOFING

1. Apply approved anti-desiccant to evergreen trees during last two weeks in October (except pines).

J. SPRAYING

1. For each spraying combine approved insecticide and fungicide to provide maximum protection for l plant materials. Three sprays annually; March, May, and August.

K. WEEDING

1. Two applications (Spring and Fall) of chemical pre-emergent spray, approved. Two applications (during growing season) of chemical contact spray (Round-Up, by Monsanto). Two days per month (every two weeks) manual weeding (by hand) during period from March 1 through September 30; remove visible weeds.

L. MULCHING

1. Keep planting areas neat and uniformly mulched to specified depth on a continuous basis. In addition to replacing and re-spreading mulch as necessitated during maintenance period completely Replenish mulch in planting areas one time, during the last month of the one-year Guarantee Period or as Directed by Landscape Architect.

M. STRAIGHTENING

1. Maintain plants in their stable upright position and at proper grade by straightening and tightening staking and guying apparatus and as approved by Landscape Architect.

N. CLEAN-UP

1. Keep planting areas neat, weeded and uniformly mulched on a continuous basis. Clean up adjacent walks and pavement, where littered because of maintenance operations, on a continuous basis.

2. Thirty-day maintenance period following Substantial Completion will be considered a lump sum item to be addressed as an item included in contract.

3.16 ACCEPTANCE AND GUARANTEE

A. SUBSTANTIAL COMPLETION

1. Submit written requests for inspection for Substantial Completion to Landscape Architect at least three calendar days prior to anticipated date of inspection and testing.
2. Substantial Completion cannot be granted and at the same time no further applications for payment shall be for more than 85 percent of Contract until there has been a walk-thru for planting at which time a "punch list" will be written consisting of items to be addressed and corrected by Landscape Contractor immediately. Depending on extent of work on "punch list", Landscape Architect will determine job to be "substantially complete" or pending the completion of punch list".
3. Submit Record Drawings and Maintenance manuals to Landscape Architect with written request for inspection.
4. Review "punch list" work jointly with Owner and Landscape Architect for Substantial Completion of total (contract) work.
5. Upon completion of repairs and replacements found necessary at time of review, Owner and Landscape Architect will confirm date of Substantial Completion and issue written notice of Substantial Completion if items on punch list have been completed. If necessary, another punch list will be Written to itemize deficiencies still existing and will be attached to written notice of substantial completion. Landscape Contractor shall complete all "punch list" items, if possible, within 30 days while continuing maintenance.
6. Date of Substantial Completion will constitute beginning date of One–Year Guarantee. This date also constitutes beginning of warranty responsibilities and acceptance by Owner and Landscape Architect.

B. GUARANTEE

1. Work, products, equipment, and materials for one year, beginning at Date of Substantial Completion as per written notice of Substantial Completion.
2. Make good damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to Owner.
3. Repair damage to grade, plants, and other work as necessary.
4. If replacement is not acceptable during or at end of the Guarantee Period, Owner may elect either subsequent replacement or credit. Replacement products shall have a similar one-year guarantee from time of replacement.
5. Guarantee applies to unacceptable conditions or losses with exception of those due to acts of nature, vandalism, or Owner neglect, as determined by Landscape Architect. Act of Nature include, but may not be limited to, high winds of hurricane or tornado force, sleet, hail, freezing rain, plants washed away in a 50 year or greater rainstorm in first month of installation, and extreme cold (as determined by Landscape Architect). Landscape Contractor agrees to replace losses due to Acts of Nature at 20 percent less than original contract price for damaged Work.

END OF SECTION

SECTION 32 90 00 - LANDSCAPING

PART 1- GENERAL

1.1 SUMMARY

A. Extent of planting is shown on drawings and in schedules.

B. Provide labor, materials, and equipment required by or reference from drawings and specifications to complete work of this section.

C. Verify plant count from plan and provide and install plant material on plan.

D. Plants shall conform to or surpass minimum quality standards as defined by American Association of Nurserymen, current edition of American Standards for Nursery Stock published by American Association of Nurserymen, Inc. in addition shall conform to sizes and descriptions in plant list.

1.2 APPROVAL AND SELECTION OF MATERIALS AND WORK

A. Selection of materials and execution of operations required under Drawings and Specifications is subject to approval of Owner and Landscape Architect. They have the right to reject materials work, which in their opinion, does not meet requirements of Contract Documents at any stage of operations. Remove rejected Work and or materials from Project Site. Replace promptly at no additional cost to Owner.

1.3 QUALITY ASSURANCE

A. Landscape Contractor shall be qualified with work resulting in successful plant establishment.

B. Landscape Contractor is required to maintain an experienced full-time supervisor on project site when planting is in progress.

C. Following codes and standards shall be observed:

1. Florida Department of Transportation (FDOT) Standard
2. Specifications for Highway Construction, current edition.
3. State and Federal laws, including for disease and insect control.
4. Requirements of authorities having jurisdiction.

D. A Pre-installation Conference shall be conducted at project prior to start of work.

1.4 WORKMANSHIP

A. Install plant materials neatly.

B. Make minor adjustments to layout as may be required and requested by Landscape Architect at no additional cost to Owner.

C. Coordinate delivery of plant material with time of installation to prevent plant material from being stockpiled on site longer than 24 hours.

D. Deliver materials in such manner as to not damage or decrease health and vigor of plant materials.

E. Store materials away from detrimental elements.

F. Coordinate with General Contractor to secure a safe staging area.

G. Handle, load, unload, and transport materials carefully to avoid damage.

H. Maintain and protect plant materials as necessary to insure health and vigor.

1.5 GUARANTEE

A. Guarantee plant materials and lawn areas for one year from date of substantial completion. Landscape Contractor shall replace plants that fail to grow properly with plants as originally specified at the earliest practical date following plant failure, without additional charges to Owner.

B. Replacement materials will be guaranteed for one year from the date of replacement.

C. Landscape Contractor shall not be responsible for replacing plants which are damaged by abuse or improper maintenance by Owner as reported by Landscape Contractor outlined below or by acts of nature occurring after acceptance.

D. Acts of nature may include but may not be limited to high winds of hurricane or tornado force, sleet, hail, freezing rain, plants washed away in 50 year or greater rainstorms in the first month of installation, and extreme cold (as determined by the Landscape Architect). Contractor agrees to replace losses due to Acts of Nature at twenty percent less than the original contract price for the damaged work.

1.6 CONTRACTOR'S PERIODIC INSPECTION

A. During guarantee period, Contractor shall make periodic inspections of the project to satisfy himself that maintenance by Owner is adequate.

B. Methods or products which he deems not normal or detrimental to good plant growth shall be reported to Owner in writing.

C. Failure to inspect and report shall be interpreted as approval and Landscape Contractor shall be held responsible for replacements.

1.7 SOIL TESTING

A. Landscape Contractor shall have soil tested by suitable laboratory chosen by Landscape Contractor and subject to written approval of Landscape Architect. Topsoil analysis shall state percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ration; deleterious material; pH; and mineral and plant-nutrient content of topsoil.

B. Soil test shall be completed in planting areas to determine lime and fertilizer requirements. Submit test results to Landscape Architect for approval. Landscape Contractor shall adjust pH and fertility based upon results. No addition to or placement of soil is to be conducted prior to initial soil test report approval.

C. Report of suitability of topsoil shall be furnished for lawn growth stating recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory topsoil.

PART 2- PRODUCTS

2.1 TOPSOIL

A. Topsoil shall be fertile, friable, sandy loam and a natural surface soil obtained from well areas reviewed by Landscape Architect and possessing characteristics of representative soils in project vicinity that produce heavy growths of crops, grass, or other vegetation.

B. Topsoil shall be free of subsoil, brush, organic litter, or objectionable weeds, clay, clots, stumps, stones, roots, or other material harmful to plant growths or hindrance to planting or maintenance operations. Should regenerative materials be present in soil, Landscape Contractor shall eradicate and remove such growth, both surface and root, which may appear in imported material within one year following acceptance of work.

C. Topsoil shall not be handled in a frozen muddy condition. Acidity range shall be between 5.0 and 7.0 inclusive. Mechanical analysis of soil shall be as follows:

Sieve Size	Percent Passing
1 inch mesh	99 - 100 percent
1/4-inch mesh	97 - 99 percent
No. 100 mesh	40 - 60 percent
No. 200 mesh	20 - 40 percent

D. Landscape Contractor to spread 2" of topsoil in all sod locations, 10" of topsoil in all planting beds, and depth per details of lightweight planting mix in all raised

planters. Landscape Contractor will be responsible for fine grading. Topsoil, regardless of source, shall meet requirements of paragraph above.

E. Stockpiled material that does not meet requirements may, at the option of Landscape Contractor, be improved by screening and addition of organic matter and chemical admixtures.

2.2 PLANTING SOIL MIXTURE

A. Provide soil mix amended as per laboratory recommendations. Basic planting soil mix consists of:

1. 50 percent topsoil (as described above)
2. 50 percent prepared additives (by volume as follows)
    a. 3 parts humus (forest peat)
    b. 1-part sterilized cow manure, commercial fertilizer and lime as recommended in soil analysis

B. Components shall be thoroughly mixed to uniform consistency by hand or machine methods.

2.3 TREES

A. Large deciduous shade trees and ornamental trees are to be field grown from rooted cuttings true to variety and not grafted material. No grafted material will be accepted for initial installation or as guarantee replacement material.

B. Balled and burlapped plant materials are to be wrapped with organic wrapping burlap only. Synthetic material will not be accepted. Remove nursery loading straps once plant material is placed in pit.

2.4 PLANTS

A. Plants shall conform to or surpass minimum quality standards as defined by American Association of Nurserymen (AAN), current edition of American Standard for Nursery Stock, published by the AAN, Inc. and in addition, shall conform to sizes and descriptions in plant list.

B. Balled and burlapped plant materials are to be wrapped with organic wrapping burlap only. Synthetic material will not be accepted. Remove nursery loading straps once plant material is placed in pit.

2.5 ORDERS FOR PLANT MATERIALS

A. Submit to Landscape Architect within 30 days from date of contract is awarded to General contractor confirmed orders for material from approved growers (listed on plant schedule). Contractor is responsible for payment of deposits required by approved growers.

B. Necessary inspection certificates shall be supplied to Landscape Architect's representative for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with Landscape Architect prior to acceptance of material.

2.6 INSPECTION & QUALITY

A. Plant materials shall be subject to inspection and approval. Landscape Architect reserves the right to reject plants which fail to meet this specification at any point during the installation of job. Rejected materials shall be promptly removed from site by Landscape Contractor at no additional cost to the owner.

B. Plant materials furnished shall be well branched, proportioned width to height, of normal habit, sound, healthy and vigorous in growth. Minimum acceptable sizes of plants shall be measured before pruning with branches in normal position and shall conform to measurements specified. Plants used where symmetry is required shall be matched as closely as possible. Plants shall meet requirements as listed in plant list.

C. Plants shall be of healthy stock, free from disease, insects, eggs, larvae and parasites of an objectionable or damaging nature.

2.7 SOURCE OF PLANTS

A. Plants shall be field nursery, container grown or collected material subject to requirements of Specifications.

B. Orders for Plant Materials - Submit to Landscape Architect within 30 days from date contract is awarded to Landscape Contractor confirmed orders for materials from approved growers. Landscape Contractor is responsible for payment of deposits required by approved growers.

C. All necessary inspection certificates shall be supplied to the Landscape Architect's representative for each shipment of plant material, as required by law. Certificates showing source of origin shall be filed with Landscape Architect prior to acceptance of the material.

D. Alternate Growers- Alternate growers will be considered by the Landscape Architect only if submitted prior to bidding. The Landscape Architect will select and tag 100% of plant materials from acceptable alternate growers. The Contractor will be responsible for all expenses related to tagging trips to alternate growers including usual fees charged by the Landscape Architect. The Contractor shall arrange for and provide transportation for the Landscape Architect. Contractor shall provide the Landscape Architect a minimum of three weeks advance notice. Contractor shall limit tagging trips to no more than two at a maximum of two days each. All tagging trips will be completed within 45 days from date contract is awarded to General Contractor.

E. Contractor will submit confirmed orders from acceptable alternate growers within ten days of tagging by the Landscape Architect. Contractor is responsible for payment of deposits required by acceptable alternate growers.

F. All trees (except Pines) are to be located by the Contractor at one of the approved nurseries listed, or equal as approved by the Landscape Architect. The Contractor should anticipate accompanying the Landscape Architect on the tagging trips but is not required to do so. Nurseries of equal quality must be approved prior to bidding.

G. Approved Tree Nurseries:

1. Bold Springs Nursery
   3920 Bold Springs RD. Monroe, GA 30655
   P: (770) 267-9196 F: (770) 267-8803
2. Ray Bracken Nursery, INC.
   815 Bracken Road Piedmont, SC 29673
   P: (800) 992-4321 F: (803) 227-1906
3. Creek Nursery
   P.O. Box 669 Iva, SC 29655
   P: (864) 348-7489 F: (864) 348-6486
4. Cherry Lake
   7836 Cherry Lake Road Groveland, FL 34736
   P: (352) 429-2171
5. Green Valley Nursery
   12975 HWY. 17 Montevallo, AL 35115
   P: (205) 665-1355 F: (205) 665-1313
6. Hawkersmith & Sons Nursery
   950 Hawkersmith Road Tullahoma, TN 37388-9204
   P: (931) 455-5436 F: (931) 455-3643
7. Hunter Trees, LLC
   P.O. Box 382733 Birmingham, AL 35238-2733
   P: (205) 296-6401
8. Moon's Tree Farm
   6327 HWY 20 Loganville, GA 30052
   P: (770) 554-6849 F: (770) 554-6852
9. Plantation Tree Company
   120 County Road 15 South Selma, AL 36703
   P: (800) 848-5064 F: (334) 872-9621
10. Select Trees
    P.O. Box 6671 Athens, GA 30604
    P: (706) 769-9879 F: (706) 769-4528
11. Green Ridge Tree Farm, LLC
    11907 County Road 117 Eutaw, AL 35462
    P: (205)372-0205 F: (205) 372-4087

H. Approved nurseries for perennials and native grasses:

1. Emerald Coast Growers
   7410 Klondike Road Pensacola, FL 32526
   P: (850) 944-0808 F: (850) 944-1006
2. Petals From the Past

16034 County Road 24 Jemison, AL 35085
P: (205) 646-0069

2.8 SOD

A. Sod shall be 100% specified grass, free of weeds, freshly dug.

2.9 GUYING & STAKING

A. Stakes for supporting trees shall be sound timber, straight, sized as shown in planting details and of sufficient length to adequately support plant. Visible surfaces shall be painted flat black.

B. Deadmen or stakes for anchoring guy wires in ground shall be of size, material, and strength adequate to hold guy taut and maintain tree firmly in an upright position.

C. Wire shall be #12-gauge galvanized wire in double twisted strand to adjust tension.

2.10 FERTILIZER

A. Fertilizer for trees, plants and ground covers shall be Milorganite, or approved equal, delivered to site in unopened containers.

B. Fertilizer shall be uniform in composition, dry and free flowing, and shall be delivered to site in original, unopened container, bearing Manufacturer's guaranteed analysis. Fertilizer shall not have been exposed to weather prior to delivery to site. After delivery until used, it shall be completely protected at all times. It shall not be stored in direct contact with ground.

C. Fertilize areas according to manufacturer's recommended rates in accordance with monthly maintenance guideline herein.

D. Cultivate and water beds or pits thoroughly after application.

E. Adjust fertilizer in accordance with interim soil test reports.

2.11 MULCH

A. Mulch shall be clean, fresh, free of noxious weed, seed, fire ants, Japanese beetles and/or fringed beetles.

B. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, or one of following:

1. All Planted Areas: 100 percent shredded pine bark free of extraneous and deleterious matter.
2. Class A hay or straw mulch for seeding per AHD Section 860.03.

2.12 LIME

A. Ground dolomitic limestone not less than 85 percent total carbonates and magnesium, ground so that 50 percent passes 100-mesh sieve and 90 percent 20-mesh sieve.

PART 3- EXECUTION

3.1 LAYOUT OF MAJOR PLANTS

A. Before commencing planting operations, location of major plants and outlines of areas to be planted shall be marked out on ground by Landscape Contractor, for approval by Landscape Architect. Contact Landscape Architect a minimum of 48 hours in advance of anticipated review of layout.

3.2 TIME AND PLANTING

A. Planting operations shall be during favorable weather in which conditions are neither extremely cold or hot nor to point that the risk of loss is too great. Landscape Contractor shall inform Landscape Architect of high risks due to weather.

3.3 PREPARATION OF PLANTING BEDS

A. Grade will be brought to a level of 6 inches below finished grade by General Contractor. Subgrade shall consist of a minimum of 4-foot depth of native soil. Landscape Contractor will spread 6 inches of topsoil, fine grading all planting beds to finish grade. This is to include debris removal and any grading required to bring landscaping finished grade to proper level for planting trees, shrubs, and ground covers. Landscape Contractor shall grade for proper drainage. Areas shall have smooth and continual grade between the existing and fixed controls such as walks and curbs. Finished grades shall meet approval of Landscape Architect before planting operations begin.

B. Circular plant pits with vertical sides shall be dug by hand or machine methods for planting and transplanting of trees and shrubs.

C. Shrub pit diameter shall be a minimum of one foot greater than spread of root mass.

D. Transplanted material is to be replanted same day it is dug or properly healed in and watered regularly to insure life.

E. Test excavated plant pits to determine if sufficient drainage is present for proper plant survival.

F. Fill area between pits, if individual pits are arranged in a group, to required grade with specified mulch, 3 inch deep. Plant beds shall be neatly edged and kept free of weeds until work is accepted.

3.4 EXCAVATION FOR PLANTING GROUND COVERS

A. Ground cover beds shall be scarified by hand or machine method to a minimum depth of 8 inches. Four inches of pine bark additive and 20 pounds per 1000 square feet of fertilizer shall be uniformly incorporated into soil to full 8" of minimum depth.

3.5 DRAINAGE TEST

A. Tree pits shall be filled with water. If percolation is less than 100 percent within a period of twelve hours, drill a 12-inch auger to a depth of 4' below bottom of pit. Retest pit. In case drainage is still unsatisfactory, notify Landscape Architect in writing of condition before planting trees. Landscape Contractor is fully responsible for warranty of trees. If tree is on slope provide trench filled with stone and 4" drainpipe to point of nearest relief.

B. Drainage Test for Plants and Ground Covers shall be spot tested to insure proper percolation.

C. Balled and container plants shall be placed firmly upon scarified subgrade and backfilled with planting soil mixture. Remove wire, cords, and burlap from top of root ball. Hand tap carefully around and under ball to fill all voids. Water during back filling. Form saucer from planting soil mixture in order to retain water.

D. Gently loosen outer roots of container grown plants to encourage outward growth.

E. Fertilizer shall be thoroughly mixed and soaked into top 2 inch of soil for plant pits.

3.6 TREE TRANSPORTATION

A. Landscape Contractor shall be responsible not only for safe transportation of plants to site but also their condition upon arrival. Trees with abrasions to bark, sun scalds, fresh cuts, or breaks of limbs which have not completely callused will be rejected. Trees which have been damaged during transit will be replaced by Landscape Contractor at no additional cost. Unit costs per plant will reflect above listed specifications.

3.7 TREE TAGS

A. Plants accepted at the nursery by Landscape Architect shall be tagged with serialized self-locking tags. Trees delivered to site without these tags or with broken tags will be rejected. The tags shall remain on trees until Landscape Contractor has been given instructions by Landscape Architect for removal.

3.8 PRUNING DECIDUOUS TREES

A. Deciduous trees and shrubs shall be pruned only to thin out heavy growth.

B. Do not top or remove terminal growing point or leader of plant.

3.9 GUY TREES 2" CALIPER AND OVER

A. Space three guys equally about each tree, attached at approximately two-fifths up trunk. Guys should be at 45-degree angles and anchored in ground with stakes. Guy to trunks with wire loops and black rubber hose drawn snug in all directions. These guys shall be equally taut. Stakes to be painted black with non-leaded outdoor paint.

B. Stake trees less than 2-inch caliper with two wood stakes driven two feet into ground with portion extending above ground approximately 1/2 of trunk height. Stake one foot from trunk, fastened at approximately two-fifths of trunk height with wire run through rubber hose. Stakes to be painted black with black non-leaded outdoor paint.

3.10 MULCH

A. Mulch planting beds and other areas designated to be mulched, with three "settled" inches of specified mulch. Individual plants are to be mulched as detailed. Mulch is to be measured after settlement and maintained as specified.

3.11 REMOVAL OF EXISTING GRASS

A. Landscape Contractor is to remove existing grass and weeds from all areas for planting and resodding as designated on plans. Existing stands are to be removed to a maximum depth of 1 inch so as to not disturb existing tree roots where present in those areas.

B. Aerate with a tined tiller to break up upper 3 inches lightly not to damage tree roots. Pick up solids for discarding and cut cleanly any roots damaged.

C. Spread a light layer of topsoil not more than 1 inch in depth over aerated area and fine grade to meet acceptance by Landscape Architect. Apply fertilizer and lime to these areas as specified previously under "Preparation of Planting Beds" or "Preparation of Sod or Seed Areas", whichever the case may be.

3.12 PREPARATION OF SOD AREAS

A. Grade will be brought to a level of 4" below finished grade by the General Contractor. Subgrade shall consist of a minimum of 4-foot depth of native soil. The landscape contractor will spread 4" of topsoil, fine grading all lawn areas to finish grade. All areas shall have smooth and continual grade between the existing and fixed controls such as walks and curbs. Contractor shall fine grade as necessary for uniformity and drainage. Roll, scarify, rake and level as necessary to obtain true, even, and firm lawn surfaces. All finished grades shall meet approval of the Landscape Architect before sod or seeding operations begin.

B. On this grade, spread specified fertilizer as per Manufacturer's recommendations and lime at a rate of 50 lbs. per 1000 square feet evenly over all areas to receive grass. A soil test shall be made prior to the beginning of fertilizing and liming and the quantities of the lime and fertilizer shall be adjusted, if necessary, to achieve a pH of 6.0 to 7.0.

C. Scarify prepared grade to depth of 6 inches, thoroughly incorporating fertilizer and lime into the top 6" of existing soil in all areas to be grassed. Caution shall be exercised to avoid damage to underground utilities. All building debris, vegetation, sticks and stones over 1 inch in any dimension shall be removed and the surface leveled and smoothed.

3.13 SODDING OPERATIONS

A. Delivery of sod shall be scheduled so as to allow laying of sod without delay. No sod shall remain stacked longer than 24 hours. In the event that sod cannot be laid immediately upon delivery, Contractor shall lay sod on as designated site, to be approved by the Landscape Architect. No sod shall overlap, and it shall be lightly watered as necessary to keep moist.

B. Lay sod when bed is not excessively wet or frozen, but when soil is moist for a depth of 4".

C. Lay sod so that no voids occur. Sod shall be tamped and rolled by hand methods. The completed surface shall be true to finish grade and even and firm at all points.

D. Do not move heavy objects over areas to be sod after the soil has been prepared.

E. A satisfactory stand is defined as a cover of living grass of specified species, after true leaves are formed in which no gaps larger than five (5) inches square occur.

F. Areas determined by the Landscape Architect to be solid rock will be exempt from this requirement.

3.14 CLEANUP AND PROTECTION

A. Keep Project Site clean and orderly during planting operations.

B. Clear grounds of debris, superfluous materials, and all equipment upon completion of Work. Remove from site to satisfaction of Landscape Architect and Owner.

C. Protect all work and materials from damage due to landscape operations and operations by other contractors, trades, and trespassers. Maintain protection until Date of Substantial Completion.

D. Contractor is responsible for theft of equipment and material at the site before, during and after installation, until Date of Substantial Completion of Work in total.

3.15 LANDSCAPE MAINTENANCE

A. SUMMARY

1. Begin maintenance at commencement of Work of this Section and Continue until Substantial Completion, as part of Work of this section.
2. Continue maintenance for a Maintenance Period of 30 days after date of Substantial Completion.
3. Provide labor, materials, equipment and means for proper maintenance of all materials and workmanship.

B. SUPERVISION

1. Submit a written report and conduct joint inspection with Landscape Architect of maintenance program and procedures, at inspection for Substantial Completion.

C. MAINTENANCE OF TREES, SHRUBS, SOD AND SEED

1. Maintain plants in a growing, well formed, healthy condition by watering, fertilizing, pruning, weeding, spraying, wrapping, straightening, replacement or by other necessary maintenance operations.

D. WATERING

1. Monitor owner's automatic watering system and schedule for proper watering of plant material.

    a. Advise Landscape Architect immediately in writing of recommended alterations due to weather or other conditions.

2. Water landscaped areas not covered by automatic watering system as frequently as necessary to maintain proper moisture level, using following schedule as a guide:

    a. Twice a month during March, April, May

b. Once a month during June, July, August, September
c. No watering from October through February, except in drought conditions.

E. FERTILIZING

1. Apply four (4) times a year to trees, shrubs, ground cover, and sod as per manufacturer's recommended application rate.

F. MOWING

1. Mow grass to a height of 2 to 2.5 inches when it reaches a height of 3 inches, or as directed by Landscape Architect. Sodded lawns shall have at least one mowing before receiving Substantial Completion.

G. SITE ANNUAL PLANTING

1. Replace annual plantings according to schedule in Drawings. Blooming plants shall be replaced as necessary throughout specified Maintenance Period to maintain blooming condition.

H. PRUNNING

1. Remove dead wood as it becomes evident. Remove living portions of plants only at direction of Landscape Architect.

I. WILT-PROOFING

1. Apply approved anti-desiccant to evergreen trees during last two weeks in October (except pines).

J. SPRAYING

1. For each spraying combine approved insecticide and fungicide to provide maximum protection for l plant materials. Three sprays annually; March, May, and August.

K. WEEDING

1. Two applications (Spring and Fall) of chemical pre-emergent spray, approved. Two applications (during growing season) of chemical contact spray (Round-Up, by Monsanto). Two days per month (every two weeks) manual weeding (by hand) during period from March 1 through September 30; remove visible weeds.

L. MULCHING

1. Keep planting areas neat and uniformly mulched to specified depth on a continuous basis. In addition to replacing and re-spreading mulch as necessitated during maintenance period completely replenish mulch in planting areas one time, during the last month of the one-year Guarantee Period or as Directed by Landscape Architect.

M. STRAIGHTENING

1. Maintain plants in their stable upright position and at proper grade by straightening and tightening staking and guying apparatus and as approved by Landscape Architect.

N. CLEAN-UP

1. Keep planting areas neat, weeded and uniformly mulched on a continuous basis. Clean up adjacent walks and pavement, where littered as a result of maintenance operations, on a continuous basis.

2. Thirty-day maintenance period following Substantial Completion will be considered a lump sum item to be addressed as an item included in contract.

3.16 ACCEPTANCE AND GUARANTEE

A. SUBSTANTIAL COMPLETION

1. Submit written requests for inspection for Substantial Completion to Landscape Architect at least three calendar days prior to anticipated date of inspection and testing.

2. Substantial Completion cannot be granted and at the same time no further applications for payment shall be for more than 85 percent of Contract until there has been a walk-thru for planting at which time a "punch list" will be written consisting of items to be addressed and corrected by Landscape Contractor immediately. Depending on extent of work on "punch list", Landscape Architect will determine job to be "substantially complete" or pending the completion of punch list".

3. Submit Record Drawings and Maintenance manuals to Landscape Architect with written request for inspection.

    a. Review "punch list" work jointly with Owner and Landscape Architect for Substantial Completion of total (contract) work.

4. Upon completion of repairs and replacements found necessary at time of review, Owner and Landscape Architect will confirm date of Substantial Completion and issue written notice of Substantial Completion if items on punch list have been

completed. If necessary, another punch list will be written to itemize deficiencies still existing and will be attached to written notice of substantial completion. Landscape Contractor shall complete all "punch list" items, if possible, within 30 days while continuing maintenance.

5. Date of Substantial Completion will constitute beginning date of One –Year Guarantee. This date also constitutes beginning of warranty responsibilities and acceptance by Owner and Landscape Architect.

B. GUARANTEE

1. Work, products, equipment, and materials for one year, beginning at Date of Substantial Completion as per written notice of Substantial Completion.

2. Make good damage, loss, destruction, or failure. Repairs and replacements shall be done promptly and at no additional cost to Owner.

3. Repair damage to grade, plants, and other work as necessary.

4. If replacement is not acceptable during or at end of the Guarantee Period, Owner may elect either subsequent replacement or credit. Replacement products shall have a similar one-year guarantee from time of replacement.

5. Guarantee applies to unacceptable conditions or losses with exception of those due to acts of nature, vandalism, or Owner neglect, as determined by Landscape Arch. Act of Nature includes, but may not be limited to, high winds of hurricane or tornado force, sleet, hail, freezing rain, plants washed away in a 50 year or greater rainstorm in first month of installation, and extreme cold (as determined by Landscape Architect). Landscape Contractor agrees to replace losses due to Acts of Nature at 20 percent less than original contract price for damaged Work.

END OF SECTION 32 90 00