PROJECT MANUAL
CONSTRUCTION DOCUMENTS

2012303

TRIUMPH PUBLIC HIGH SCHOOLS
FINISH OUT
at
Gracepoint Church

ABILENE, TX

Volume I

Set Number_____

JANUARY 15, 2024

DOCUMENT 00 01 01
PROJECT TITLE PAGE
PROJECT MANUAL
CONSTRUCTION DOCUMENTS

PROJECT DETAILS

Project Description: Project consists of approximately 10,116 S.F. tenant finish-out to the existing building. The improvements consist of finishes upgrade to the existing classrooms, and the conversion of an existing classroom into restrooms for students. Building Exterior shall remain the same.

Project located at:
Grace Point Church
221 Oak Street
Abilene, Texas 79602

OWNER REPRESENTATIVE

Triumph Public High Schools
Contact: Frances Berrones-Johnson, Superintendent CEO
1208 South Presa
San Antonio, Texas 78210-2838

ARCHITECT

Laura N. Warren, AIA, NCARB/President
The Warren Group Architects, Inc.
804 S. Main Street
McAllen, Texas 78501
Office: 956.994.1900
lwarren@twgarch.com
Cc: xgonzalez@twgarch.com
admin@twgarch.com

END OF DOCUMENT

DOCUMENT 00 01 07
SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

SEAL

EXP 10-31-2024

ARCHITECT	The Warren Group Architects Inc. Texas Registration No. 30112289 Sections except where indicated as prepared by other design professionals of record.

END OF DOCUMENT

DOCUMENT 00 01 07
SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

1.15.2024

MEP ENGINEERS

MEP Solutions Engineering
Texas Registration No. F-9748
Luis Javier Peña, P.E.
Texas Registration No. 97260

The following sections:

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

DIVISION 22: PLUMBING

220510 - PLUMBING GENERAL REQUIREMENTS
220515 - MATERIALS AND METHODS
220529 - HANGERS AND SUPPORTS
220553 - PLUMBING IDENTIFICATION
220713 - PLUMBING INSULATION
221316 - SANITARY WASTE AND VENT PIPING
224250 - PLUMBING SPECIALTIES

DIVISION 23: HEATING, VENTILATING AND AIR CONDITIONING

230510 - MECHANICAL GENERAL REQUIREMENTS
230515 - MATERIALS AND METHODS
230529 - HANGERS AND SUPPORTS
230553 - MECHANICAL IDENTIFICATION
230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 - HVAC INSULATION
233113 - METAL DUCTS
233300 - DUCT ACCESSORIES
233713 - DIFFUSERS, REGISTERS, AND GRILLES
238130 - DUCT-FREE SPLIT SYSTEMS

DOCUMENT 00 01 07
SEALS PAGE

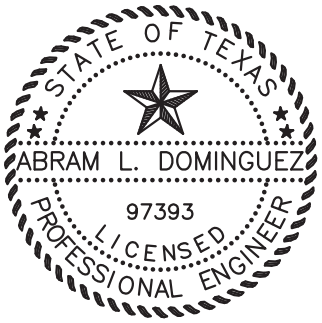
DESIGN PROFESSIONALS OF RECORD

MEP ENGINEERS — MEP Solutions Engineering
Texas Registration No. F-9748
Abram L. Dominguez, P.E.
Texas Registration No. 97393

The following sections:

DIVISION 26: ELECTRICAL

260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
262726 - WIRING DEVICES
262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS



1.15.2024

Abram L. Dominguez

END OF DOCUMENT

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

DOCUMENT 00 01 10
TABLE OF CONTENTS

COM Check – Interior Lighting Compliance Certificate
Triumph High School Finish – out HVAC Load Analysis

END OF DOCUMENT

DOCUMENT 00 01 15
LIST OF DRAWING SHEETS

LIST OF DRAWING SHEETS

A. Drawings: Consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Triumph Public Highschool New Abilene Campus, Grace Point Church, 221 Oak Street, Abilene, TX 79602 dated January 15, 2024, as modified by subsequent Contract modifications.

B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:

ARCHITECTURAL:

G0.00 COVER SHEET
G0.01 GENERAL NOTES
LS1.10 LIFE SAFETY PLAN
A1.11 DEMO AND NEW FLOOR PLAN
A1.12 ROOM FINISH SCHEDULE, FLOOR PATTERN, AND ACCENT WALL PATTERN
A1.21 CEILING PLAN AND ENLARGED FLOOR PLAN AND WALL PATTERN
A6.21 DOOR SCHEDULE AND ELEVATION

MEP:

DM1.01 DEMO-MECHANICAL FLOOR PLAN
DE1.01 DEMO-ELECTRICAL LIGHTING FLOOR PLAN
M1.01 MECHANICAL FLOOR PLAN
E1.01 ELECTRICAL LIGHTING FLOOR PLAN
E1.02 ELECTRICAL POWER FLOOR PLAN
E2.01 ELEC LEGEND SPECS RISER DIAGRAM & SCHS
P1.01 PLUMBING SEWER FLOOR PLAN
P1.02 PLUMBING HW/CW FLOOR PLAN
P2.01 PLUMBING SCHEDULES

END OF DOCUMENT

SECTION 00 18 00
RESPONDENTS QUALIFICATIONS

PART 1 - GENERAL

1. SECTION INCLUDES

This section contains the bidder's qualifications for the project.

2. REFERENCES – Not Used

3. BIDDER'S EXPERIENCE

a. Respondent shall have experience, human resources and access to the equipment necessary for performing the project work.

b. Respondent shall have performed substantially the same type of work as is required in the project in its prior work experience.

c. The successful Respondent shall appoint a "competent person" of the company to be full time supervisor or superintendent at the site. The competent person must be available at all times during the pendency of the project and must be available during "off-hours.

4. STATEMENT OF QUALIFICATIONS AND OWNER'S REVIEW

Respondent shall submit at the time of Proposal date and on the form furnished in this section for that purpose, a Statement of Respondent's Qualifications. The Owner shall have the right to take such steps or perform such investigations as it deems necessary to determine the ability of the Respondent to perform the obligations under this Contract, and the Respondent shall furnish any and all information or data requested for this purpose. The Owner reserves the right to reject, qualify or disqualify any Proposal if the evidence submitted by or investigation of such Respondent fails to satisfy the owner that such Respondent is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional Proposals will not be accepted.

1.2 CONSIDERATION OF PROPOSAL

a. Properly identified Proposals received on time will be considered.
b. Triumph Public High Schools shall have the right to reject any or all Proposals and in particular to reject a Proposal not accompanied by any required security bond or data required by the Contract Documents or a Proposal in any way incomplete or irregular.
c. Triumph Public High Schools shall have the right to waive any formality or irregularity in any proposal received.
d. If Triumph Public High Schools accepts any Alternates, the Triumph Public High Schools shall have the right to accept the Alternates in any order or combination.
e. It is the intent of Triumph Public High Schools to award a contract to the offeror submitting the proposal providing the "best value" to the School District provided the Proposal has been submitted in accordance with the requirements of the Solicitation Documents and selection criteria.

f. Award of Contract may include full consideration of Proposal Amount and Alternates if any. Triumph Public High Schools may accept or reject any or all alternates if any and make an award of contract as deemed in the best interest of Triumph Public High Schools. Triumph Public High Schools' decision shall be final.

g. Contractor may provide supplemental information to support selection criteria.

h. The selection of a qualified Contractor shall be based on the enclosed Ranking Criteria.

STATEMENT OF QUALIFICATIONS AND OWNER'S REVIEW

B. Respondent shall submit in this section, a Contractors Qualifications Statement. Triumph Public High Schools shall have the right to take such steps or perform such investigations as it deems necessary to determine the ability of the respondent to perform the obligations under this Contract, and the respondent shall furnish any and all information or data requested for this purpose. Triumph Public High Schools reserves the right to reject any proposal if the evidence submitted by or investigation of such respondent fails to satisfy Triumph Public High Schools that such respondent is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional proposals will not be accepted. Refer Supplementary Instructions to Respondents Document 00 22 13.

Date: _____, 2024

Proposal of _____ (hereinafter called "Respondent") a

_____ (Corporation, Partnership, LLC, LLP, etc.) organized and existing under the laws of the

State of Texas.

To Triumph Public High Schools (hereinafter called "Owner").

The Respondent is in compliance with the Respondent's Qualifications Section(s) of the specifications for the

_____, having examined the plans and

specifications with related documents and the site of the proposed work, and being familiar with all the conditions

surrounding the construction of the proposed project, hereby submits the following:

STATEMENT OF QUALIFICATIONS.

P A R T 2 P R O D U C T S - Not Used
P A R T 3 E X E C U T I O N - Not Used

END OF SECTION

Ranking Criteria for Selection of Building Contractors

Project Name: _____ Contractor: _____

Project Location(s): _____ Proposal: _____

Ranking Date: _____ Proposal Opening Date: _____

CATEGORY	MAXIMUM SCORE	RANKED SCORE	TOTAL POINTS
1. PROPOSAL AMOUNT • Construction Cost	**35**	_____	
2. Proposers Experience / Proposers Reputation And Proposers References	**20**	_____	
3. Extent to which the proposer Impacts the schools ability to Comply with rules relating to Historically Underutilized Businesses	**5**	_____	
4. Proposers Safety Record	**10**	_____	
5. Proposers Proposed Personnel and Subcontractors	**15**	_____	
6. Proposers Financial Capability in relation to the scope of the project	**10**	_____	
7. Proposer Past Relationship with The school or other Charter/Public schools	**5**	_____	
TOTAL POINTS SCORED	**100**		_____

DOCUMENT 00 21 13
INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

A. AIA Document A701, "Instructions to Bidders," Refer to AIA Procurement and Contracting Requirements by reference.

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

END OF DOCUMENT

DRAFT

AIA® Document A701® – 2018

Instructions to Bidders

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

«Triumph Public High School, Finish-Out »
« Renovations and New Restroom Construction Work »
« at Grace Point Church
221 Oak Street
Abilene, TX 79602 »

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

« Triumph Public High Schools »« »
« 1218 South Presa »
« San Antonio, Texas 78210 »
« Telephone Number: (210) 227-0295 »

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

« Nassri – Warren Group Architects, Inc. d/b/a/ »« The Warren Group Architects, Inc. »
« 804 South Main Street »
« McAllen, Texas 78501 »
«Telephone Number: (956) 994 - 1900
Fax Number: (956) 994-1962»

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.

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ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.
(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

« All interested offerors are required to request in writing Online Procurement and Contracting documents via email: Contact Laura Warren, AIA, NCARB via email at lwarren@twgarch.com and carbon copy Crystal Chavez chavez@twgarch.com, and Erika Garza admin@twgarch.com for a link. Downloading these documents will ensure all interested offerors will automatically receive updates via email. »

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§ 3.1.2 A hardcopy of the Construction Document set, and any Addendums can be reproduced at the General Contractors expense at RGV Reprographics, Inc. (956) 686 – 1525, located at 519 Broadway St. McAllen, TX 78501 Please note the notices of Addendums are to be issued digitally.

§ 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.)

«Submit inquiries in writing via e-mail to Laura Warren, AIA, NCARB, Principal, The Warren Group Architects, Inc. at e-mail: lwarren@twgarch.com, and carbon copy Crystal Chavez chavez@twgarch.com, and Erika Garza admin@twgarch.com »

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

§ 3.3 Substitutions

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

§ 3.3.2 Substitution Process

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

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

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

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

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

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

§ 3.4 Addenda

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

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

« Notices of Addendums are to be issued digitally. »

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

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

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

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

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

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

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

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

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

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

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

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

§ 4.2 Bid Security

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

(Insert the form and amount of bid security.)

« A Performance Bond, in conformance with Texas Government Code Chapter 2253, and a Payment Bond, in conformance with Texas Government Code § 53.201-.211 will be required on this project. The successful offeror must deliver to the Owner, not later than the tenth (10th) day after the date the design-build firm executes the contract, fully executed Performance and Payment Bonds in an amount of one hundred percent (100%) of the construction budget as security for the faithful performance of contract obligations and payment of all persons performing labor and furnishing

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materials in connection with this contract. All bonds shall be issued on AIA Document A-312 by a surety company licensed, listed, and authorized to issue bonds in the State of Texas by the Texas Department of Insurance. »

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

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

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

§ 4.3 Submission of Bids

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

« The Warren Group Architects, Inc. (TWG) will create via ShareFile Individual online folders for each offeror to upload
their electronic Competitive Sealed Proposal Package. TWG will provide each offeror access to their electronic folder via
email. Offers will be required to Upload as a separate attachment Document 00 41 13 "(CSP) Competitive Sealed Proposal Form" located in the Project Manual. »

§ 4.3.2 Electronic copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be included in the Competitive Sealed Proposal Package. . The Electronic Competitive Sealed Proposal Package 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.

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation for the Request for Competitive Sealed Proposals 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 Competitive Sealed Proposals.

§ 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 Competitive Sealed Proposal

§ 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 Competitive Sealed Proposals 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.

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

« »

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Competitive Sealed Proposals

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 Competitive Sealed Proposals

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

§ 5.3 Acceptance of Competitive Sealed Proposals (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-PROPOSAL 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 proposal.

§ 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

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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 offeror 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.)

« AIA Document A105-2017, Standard Short Form of Agreement between Owner and Contractor, as modified by the Owner. General Contractor shall be responsible to fill out their portion of the AIA Contract Document. »

.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.)

« »

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.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
Refer to Section 00 01 15 LIST OF DRAWING SHEETS	TRIUMPH PUBLIC HIGH SCHOOL NEW ABILENE CAMPUS, GRACE POINT CHURCH, 221 OAK STREET, ABILENE, TX 79602	JANUARY 15, 2024

.6 Specifications

Section	Title	Date	Pages
REFER TO PROJECT MANUAL		JANUARY 15, 2024	

.7 Addenda:

Number	Date	Pages
TBD		

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

« »

[« »] The Sustainability Plan:

Title	Date	Pages
N/A		

[« »] 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.)

« Limited Lead-in-Drinking Water Survey Report, Dated December 1, 2023, issued by AEI Consultants, and Limited NESHAP Pre-Renovation Asbestos Survey Report, Dated November 20, 2023, issued by AEI Consultants »

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DOCUMENT 00 22 13
SUPPLEMENTARY INSTRUCTIONS

1.1 INSTRUCTIONS TO GENERAL CONTRACTOR

A. Instructions to General Contractor for Project consist of the following:

1. AIA Document A701, "Instructions to General Contractor".
2. The following Supplementary Instructions to General Contractor that modify and add to the requirements of the Instructions to General Contractor.

1.2 SUPPLEMENTARY INSTRUCTIONS TO GENERAL CONTRACTOR, GENERAL

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

1.3 ARTICLE 2 – GENERAL CONTRACTOR'S REPRESENTATIONS

A. Section 2.1.3.1:

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

B. Section 2.1.5:

1. 2.1.5 - The General Contractor is a properly licensed Contractor according to the laws and regulations of State of Texas and meets qualifications indicated in the Procurement and Contracting Documents.

C. Section 2.1.6:

1. 2.1.6 - The General Contractor has incorporated adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.4 ARTICLE 3 - DOCUMENTS

A. 3.4 - Addenda:

3.4.3 - Addenda may be issued at any time prior to General Contractor’s contract.

1. Section 3.4.4.1:

a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

1) 3.4.4.1.1 - Information received as part of the Contract indicates that the Contract, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.

2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.5 ARTICLE 4 - BIDDING PROCEDURES

A. 4.1 - Preparation of Bids:

1. Section 4.1.1.1:

a. 4.1.1.1 - Printable electronic Bid Forms and related documents are available from a download link.

2. Section 4.1.9:

a. 4.1.9 - 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.

3. Section 4.1.10:

b. 4.1.10 - Owner shall be exempt from sales taxes. Owner shall provide sales tax exemption certificate.

B. 4.3 - Submission of Bids:

1. Section 4.3.1.2:

a. 4.3.1.2 - Include Bidder's Contractor License Number applicable in Project jurisdiction on the front cover of their Electronic Competitive Sealed Proposal.

C. 4.4 - Modification or Withdrawal of Bids:

1. 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 written on the sealed bid envelope 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.

D. 4.5 - Break-Out Pricing Bid Supplement:

1. Section 4.5:

a. 4.5 - Provide detailed cost breakdowns on forms provided no later than two business days following Architect's request.

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

1. Section 4.6:

a. 4.6 - Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products on forms provided no later than two business days following Architect's request. 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.

1.6 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. 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.

1.7 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. Bond Requirements:
1. Refer to Owner Contract Document. If required, deliver to the Owner within (5) five days of the date of the notification of intent to enter Contract.

B. Time of Delivery and Form of Bonds:
1. Refer to Owner Contract Document.
2. If required, Bonds shall be executed and be in force on the date of the execution of the Contract.
3. The Owner, at the Owner’s discretion, reserves the right to accept or reject the company underwriting the bonds on the basis of their previous performance.

1.8 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. AIA DOCUMENT A105-2017 Standard Short From of Agreement Between Owner and Contractor, as modified by the Owner.

1.9 ARTICLE 9 - EXECUTION OF THE CONTRACT

1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within 5 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through The Warren Group Architects, Inc, Laura Nassri Warren, AIA, NCARB /Principal, 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 General Contractor is obligated to deliver the executed Agreement.

END OF DOCUMENT

DOCUMENT 00 25 13
PREBID MEETING

1.1 PREBID MEETING

A. Owner and Architect, will conduct a Prebid meeting along with site visit as indicated below:

1. Meeting Date: Thursday, February 1, 2024

2. Meeting Time: 9:00 A.M. Central Standard Time

3. Location: 221 Oak Street, Abilene, Texas 79602

B. Attendance:

1. Prime Bidders: Strongly encouraged to attend.

2. Subcontractors: No mandatory attendance Pre-Bid meeting requirement.

3. Notice: No mandatory attendance Pre-Bid meeting requirement. Site walk-through will follow conclusion of Pre-Bid meeting.

C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.

D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:

a. Invitation for Competitive Sealed Proposals.

b. Bid Instructions.

c. Bid Proposal Form

d. Insurances.

e. Bid Security.

f. Bid Submittal Requirements.

g. Bid Submittal Checklist.

h. Notice of Award.

2. Communication during Bidding Period:
    a. Obtaining documents.
    b. Access to Project Web site.
    c. Bidder's Requests for Information.
    d. Bidder's Substitution Request/Prior Approval Request.
    e. Addenda.
3. Contracting Requirements:
    a. Agreement.
    b. The General Conditions.
    c. The Supplementary Conditions.
    d. Other Owner requirements.
4. Construction Documents:
    a. Scopes of Work.
    b. Temporary Facilities.
    c. Use of Site.
    d. Work Restrictions.
    e. Alternates and Allowances.
    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 Visits.

8. Post-Meeting Addendum.

E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. 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

DOCUMENT 00 26 00
PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 01 25 00 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 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.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:

1. Extensive revisions to the Contract Documents are not required.

2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.

3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to The Warren Group Architects, Inc. Procurement Substitution Request must be made in writing by prime contract Bidder only in compliance with the following requirements:

1. Requests for substitution of materials and equipment will be considered if received no later than 3 days prior to date of bid opening.
2. Submittal Format: Submit Procurement Substitution Request, using format provided on Project Web site.

a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.

b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:

1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
2) Copies of current, independent third-party test data of salient product or system characteristics.
3) Samples where applicable or when requested by Architect.
4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. 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.
5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from local City Ordinances.
7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.

d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT

SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ _____ Article/Paragraph: _____

Proposed Substitution: _____

_____ Manufacturer:

_____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

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

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

The Undersigned certifies:

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

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 25 00 Substitution Procedures.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

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Form Version: January 2013
CSI Form 1.5C

DOCUMENT 00 41 13

(CSP) COMPETITIVE SEALED PROPOSAL FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: Triumph Public High Schools Finish Out at Grace Point Church

C. Project Location: 221 Oak Street
Abilene, Texas 79602

D.
Owner: Triumph Public High Schools
Contact: Frances Berrones – Johnson, Superintendent/ CEO
1208 South Presa
San Antonio, Texas 78210-2838

E. Architect: Laura Nassri Warren, AIA, NCARB/President, Principal, The Warren Group Architects, Inc., 804 S. Main Street, McAllen, Texas 78501.

F. Architect Project Number: 2012303.

1.2 CERTIFICATIONS AND BASE BID (WITH ALLOWANCES, IF ANY)

A. Competitive Sealed Proposal, Single-Prime (All Trades) Contract: The undersigned Respondent, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by The Warren Group Architects, Inc. and Architect's consultants, having visited the site, and being familiar with all 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 sum of:

_____
(Company Name)

1. _____ Dollars

($_____).

Alternate 1_____Dollars

($_____).

1.3 BID GUARANTEE

A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award, if offered within 90 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 five percent (5%) of the Base Bid amount above:

1. _____Dollars

($_____).

B. In the event Owner does not offer Notice of 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.

1.4 SUBCONTRACTORS AND SUPPLIERS

A. The following companies shall execute subcontracts for the portions of the Work indicated:

1. General Conditions:

_____.

2. Site Work:

_____.

3. Concrete Scope:

_____.

4. Masonry Scope:

_____.

5. Structural Steel Work:

_____.

6. Carpentry:

_____.

7. Thermal & Moisture Protection Scope:

   _____.

8. Doors, Windows, Glass & Hardware Work:

   _____.

9. Painting (Finishes) Work:

   _____.

10. Miscellaneous/Specialties:

    _____.

11. Mechanical/Plumbing Work:

    _____.

12. Electrical Work:

    _____.

13. Roofing:

    _____.

14. Fire Protection Work:

    _____.

1.5 TIME OF COMPLETION

A. 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 Architect, and shall fully complete the Work by May 19, 2024.

1.6 ACKNOWLEDGEMENT OF ADDENDA

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

1. Addendum No. 1, dated _____.
2. Addendum No. 2, dated _____.
3. Addendum No. 3, dated _____.
4. Addendum No. 4, dated _____.
5. Addendum No. 5, dated _____.
6. Addendum No. 6, dated _____.

1.7 BID SUPPLEMENTS

A. The following supplements are a part of this Competitive Sealed Proposal Form and are attached hereto.

1. Competitive Sealed Proposal Form Supplement - Instructions to Bidders (AIA Document A701).
2. Competitive Sealed Proposal Form Supplement - CSI Form 1.5C Substitution Request

1.8 CONTRACTOR'S LICENSE

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

1.9 DOCUMENT CONTINUES

1.10 SUBMISSION OF BID

Respectfully submitted this _____ day of _____, 2024.

Submitted By: _____
(Name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

Witness 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

DOCUMENT 00 43 21
ALLOWANCE FORM

1.1 BID INFORMATION

A. General Contractor: _____.

B. Project Name: Triumph Public High Schools Finish-Out at Grace Point Church

C. Project Location: 221 Oak Street
Abilene, Texas 79602

D. Owner: Triumph Public High Schools
Contact: Frances Berrones-Johnson, Superintendent CEO
1208 South Presa
San Antonio, Texas 78210-2838

E. Architect: Laura Nassri Warren, AIA, NCARB /Principal
The Warren Group Architects, Inc.
804 South Main Street
McAllen, Texas 78501
lwarren@twgarch.com
Cc: clopez@twgarch.com
xgonzalez@twgarch.com
admin@twgarch.com
Office 956.994.1900

F. Architect Project Number: 2012303

1.2 RESPONDENT BID FORM SUPPLEMENT

A. This form is required to be attached to the Proposal Form.
B. The undersigned Respondent certifies that Base Proposal submission to which this Respondent Proposal Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 01 21 00 "Allowances."

Allowance No. 1: Lump-Sum Allowance: General Contractor to include Owners Contingency Allowance in the amount of $20,000.00 (Twenty Thousand U.S. Dollars).

Allowance No. 2: Lump-Sum Allowance: General Contractor to include Architect Design Contingency-Betterment Allowance in the amount of $15,000.00 (Fifteen Thousand U.S. Dollars).

1.3 SUBMISSION OF PROPOSAL BID SUPPLEMENT

A. Respectfully submitted this ____ day of _____, 2024.

Submitted By: _____
(Insert name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President

END OF DOCUMENT

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 attached to the Bid Form.

1.2 PROPOSED SCHEDULE OF VALUES FORM

A. Proposed Schedule of Values Form: Provide a breakdown of the bid amount, including alternates, in enough detail to facilitate continued evaluation of bid. Coordinate with the Project Manual Table of Contents. Provide multiple line items for principal material and subcontract amounts in excess of five percent of the Contract Sum.

B. Arrange schedule of values consistent with format of AIA Document G703 Continuation Sheet.

1. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT

DOCUMENT 00 43 93
BID SUBMITTAL CHECKLIST

1.1 BID INFORMATION

A. Bidder: _____.

B. Prime Contract: _____.

C. Project Name: **Triumph Public High School Finish-Out, at Grace Point Church**

D. Project Location: **221 Oak Street, Abilene, Texas 79602**

E. Owner: **Triumph Public High School**

F. Architect: **The Warren Group Architects, Inc., Laura Warren, AIA, NCARB / President**

G. Architect Project Number: **2012303**

1.2 BIDDER'S CHECKLIST

H. 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.

I. Attach this completed checklist to the outside of the Submittal envelope.

- ☐ Used the Bid Proposal Form provided in the Project Manual.
- ☐ Prepared the Bid Form as required by the Instructions to Bidders.
- ☐ Indicated on the Bid Form the Addenda received.
- ☐ Attached to the Bid Form: Bid Supplement Form - Allowances.
- ☐ Attached to the Bid Form: Proposed Schedule of Values Form.
- ☐ Attached to the Bid Form: Bid Bond OR a certified check for the amount required.
- ☐ Bid Packet shows name and address of the Bidder.
- ☐ Bid Packet shows the Bidder's Contractor's License Number.
- ☐ Bid Packet shows name of Project Number and Project name being bid.
- ☐ Bid Packet shows name of Prime Contract being bid, if applicable.
- ☐ Bid Packet shows time and day of Bid Opening.
- ☐ Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
- ☐ Verified that the Bidder can provide Certificates of Insurance in the amounts indicated.

END OF DOCUMENT

SECTION 00 45 00
BID BOND

PART 1 - GENERAL

1.1 SECTION INCLUDES

This section describes the standardized bid bond form to be submitted with the bid on the project.

1.2 REFERENCES – Not Used

1.3 DEFINTIONS – Section 07 00 00

1.4 BID BOND FORMS

Bidder is to inset an original bid bond or a copy of cashier's check provided for bid bond Purposes. Original check is to be submitted along with bid.

PART 2 - PRODUCT – Not Used

PART 3 - EXECUTION

STANDARDIZED FORMS FOLLOW

END OF SECTION

DOCUMENT 00 60 00
FORMS

1.1 1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:

1. AIA Document A105, "Standard Short Form of Agreement between Owner and Contractor, as modified by the Owner."

a. The General Conditions for Project are AIA Document A201, "General Conditions of the Contract for Construction."

2. The General Conditions are included in the Project Manual.

3. The Supplementary Conditions for Project are separately prepared and included in the Project Manual.

4. Owner's document(s) bound following this Document.

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org.

C. Forms:

1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."

2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."

D. Information and Modification Forms to be provided by General Contractor:

1. Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."

2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."

3. Change Order Form: AIA Document G701, "Change Order."

4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."

5. Form of Change Directive: AIA Document G714, "Construction Change Directive."

E. Payment Forms:

1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."

2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."

3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."

4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."

5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF DOCUMENT

DOCUMENT 00 72 00
GENERAL CONDITIONS NOTICE

1.01 FORM OF GENERAL CONDITIONS

A. The “General Conditions of the Contract for Construction”, American Institute of Architects’ A.I.A. Document A201, Latest Edition, and “Supplementary Conditions” on file in the offices of the Architect and the Owner’s Supervising Engineer, are hereby a part of these Specifications and shall apply and be binding to all Contractors as though written in full herein.

B. The Contractors shall be held to have examined and become familiar with all provisions of the above-referenced documents.

C. Certain provisions of these standard “General Conditions of the Contract for Construction” have been revised or modified by portions of this “NOTICE” and the “SUPPLEMENTARY CONDITIONS”. In all such cases, the provisions of the “NOTICE” and the “SUPPLEMENTARY CONDITIONS” shall take precedence, to the extent of any conflict or inconsistency, over these standard “General Conditions of the Contract for Construction”.

D. Wherever the word “Owner” appears in such “General Conditions”, and elsewhere in these documents, it shall be interpreted as “Triumph Public High Schools”, so that the word “Board” is hereby substituted for the word “Owner” throughout these documents.

E. Wherever the word “Contractor” or “Subcontractor” appears in these documents, it shall be interpreted to mean the Contractor whose Proposal has been accepted for that respective Section of the Work.

1.02 SUPPLEMENTARY CONDITIONS

A. Refer to Section 00 73 00 for amendments to these General Conditions.

END OF SECTION

DRAFT

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

« Triumph Public High School, Finish-Out »
« Renovations and New Restroom Construction Work »
« at Grace Point Church
221 Oak Street
Abilene, TX 79602 »

THE OWNER:
(Name, legal status and address)

«Triumph Public High Schools »« »
« 1218 South Presa »
« San Antonio, Texas 78210 »
« Telephone Number: (210) 227-0295 »

THE ARCHITECT:
(Name, legal status and address)

« Nassri-Warren Group Architects, Inc. dba The Warren Group Architects, Inc. »« »
« 804 S. Main Street »
« McAllen, TX 78501 »
«Telephone Number: (956) 994-1900
Fax Number: (956) 994-1962 »

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.

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

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INDEX
(Topics and numbers in bold are Section headings.)

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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.

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§ 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

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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.

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§ 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

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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.

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§ 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.

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§ 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

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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

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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.

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§ 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.

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§ 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

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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.

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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.

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§ 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;

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.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.

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§ 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.

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§ 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

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.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.

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§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

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§ 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;

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.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

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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

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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

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The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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§ 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

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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

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Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- **.1** that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- **.2** that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- **.1** cease operations as directed by the Owner in the notice;
- **.2** take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- **.3** except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work

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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

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.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.

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§ 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

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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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SUPPLEMENTARY CONDITIONS

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

The Agreement takes precedence over all other Contract Documents.

1.2 EXECUTION, CORRELATION AND INTENT

No allowance shall subsequently be made on behalf of the Contractor on account of an error on his part or his negligence or failure to acquaint himself with the conditions of the site.

1.2.2.1. Before submitting proposal for this work, each bidder shall be held responsible for having examined the premises and satisfied himself as to the existing conditions under which he will be obliged to operate and that will, in any manner, affect the work under this Contract. No allowance shall be made subsequently in the connection on behalf of the contractor for any error or negligence on his part, nor for slight discrepancies on drawings as to grades, slopes and elevations.

1.2.2.2 In case the bidder finds any discrepancy between the conditions at the site and the requirements of these plans and specifications, he shall notify the Owner in writing before the opening of bids and the Owner will issue the necessary instructions to all bidders.

1.2.2.2.1 In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes, and ordinances, the Contractor shall (1) provide the better quality or greater quantity of Work or (2) comply with the more stringent requirement; either or both in accordance with the Architect's reasonable interpretation. The terms and conditions of this paragraph 1.2.3, however, shall not relieve the Contractor of any obligations set forth in Paragraphs 3.2 and 3.7. Before ordering any materials or doing any Work, the Contractor and each Subcontractor shall verify measurements at the Project site and shall be responsible for the correctness of such measurements. Any difference, which may be found, shall be submitted to the Architect for resolution before proceeding with the Work.

Add the following to Paragraph 1.2.4:

Such separations shall not operate to make the Architect an arbiter to establish subcontract limits.

Add the following after Paragraph 1.2.5:

1.2.6 Titles of Sections and Articles in these Specifications are introduced merely for convenience and are not to be construed as a correct or complete segregation or tabulation of the various units of material and/or work. The Contractor shall be solely responsible for omissions or duplications by the Contractor or any Subcontractors due to real or alleged error, either direct or implied, in arrangement of matter in the Contract Documents.

1.2.7 Contractor shall check Drawings and Specifications immediately upon their receipt, and shall notify Architect in writing not later than ten (10) days after receipt of them, of errors, discrepancies, or omissions. Contractor shall verify dimensions and details before ordering materials for laying out work and shall be responsible for errors that might have been avoided by such check. Deviations from Drawings and dimensions shall be made only with the Architect's permission. No exchange or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the Drawings. Any difference, which may be found, shall be submitted to the Architect for instructions before proceeding with the work.

1.2.8 Specifications and Drawings are intended to be complementary and in agreement each with the other. All work or materials called for by either shall be Performed and/or furnished as if called for by both. In cases of discrepancy concerning dimensions, quantities, and location, the contractor shall, in writing, call to the attention of the Architect any discrepancies between Specifications, Plans, Details or Schedules. The Architect will then inform the Contractor, in writing, which document takes precedence. Should the Contractor not notify the Architect as per the prior instructions, the greater amount of work, cost and/or materials shall be included in the base bid or alternate bid amount as part of this agreement.

1.2.9 These Specifications are intended to supplement the Drawings, the two being considered cooperative and, therefore, it will not be the province of these Specifications to mention any portion of the construction which the Drawings are competent to explain, and such omission will not relieve the Contractor from carrying out such portions as are only indicated from the Drawings, and should items be required by these Specifications which are not indicated on the Drawings, they are to be supplied.

1.2.10 The Contractor shall supply all labor, materials, transportation, apparatus, light, energy, scaffolding, and tools necessary for the entire proper completion of the Work.

1.2.11 Unless specified otherwise, all of the materials incorporated in the work shall be new and of the best of the kind of grades specified and all workmanship be up to the best recognized standard known to the various trades.

1.3.1 The Drawings, Specifications, and other similar or related documents and copies thereof are furnished to the Contractor for the purpose of performing the Work and are, and shall remain, the property of the Architect.

ARTICLE 2 - OWNER

2.2 INFORMATION AND SERVICE REQUIRED OF THE OWNER

Architect will furnish Contractor Online Procurement and Contracting Documents: Contact Crystal Lopez at clopez@twgarch.com for a download link. Files are available for download after 2:00 p.m. Central Time on Tuesday, January 16, 2023. Any other questions to be in written/e-mailed format to the attention of Laura Nassri Warren at lwarren@twgarch.com and a copy to Crystal Lopez at clopez@twgarch.com . Online access will be provided to prime bidders

only. A hard copy of the Construction Document set, and any Addendums can be reproduced at the General Contractors expense, at RGV Reprographics, Inc., 956-686-1525, located at 519 S Broadway St, McAllen, TX 78501. Please note the Notices of Addendums are to be issued digitally.

2.2.7 OWNER'S RIGHT TO SEPARATE CONTRACT

Although it is contemplated that this Contract shall include all of the work intended to be done at this time, it is possible that the Owner may let other Contract in connection with the work herein specified. In any event, the Owner reserves the right to do so, in which case the Contractor shall afford reasonable opportunity for the storage of materials and the execution of work by others.

ARTICLE 3 - CONTRACTOR

3.2 VIEW OF CONTRACT DOCUMENTS

3.2.1 Contractor shall carefully study and compare the Agreement, Conditions of the Contract, Drawings, Specifications, Addenda, and Modifications and shall at once report, in writing, to the Architect any error, inconsistency, or omission he may discover. Contractor shall be liable for any damage to Owner for failure to so report any error, inconsistency, or omission he may discover or should have discovered, but he shall not be liable to Owner or Architect for any damage resulting from any such error, inconsistency or omission he should not have discovered or which he did discover and at once so reported. Contractor shall do no work without approved Drawings and Specifications.

3.2.4 Should the Specifications and Drawings fail to particularly describe the material or kind of goods to be used in any place, then it shall be the duty of the Contractor to make inquiry of the Architect as to what is best-suited. The material that would normally be used in this place to produce first quality finished Work shall be considered a part of the Contract.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.5 In laying out the work, the Contractor shall verify all measurements and dimensions and shall immediately report any errors to the Architect. The Contractor shall employ an experienced and competent instrument person to lay out the structure and establish a permanent and accessible bench mark from which the grades may be established and checked from time to time during the progress of the work. Contractors shall lay out building corners accurately and secure approval of the Architect before proceeding with excavation.

3.4 LABOR AND MATERIALS

3.4.1.1 Not later than ten (10) days from the Contract Date, the Contractor shall provide a list of the names of the manufacturers proposed to be used for each of the following products listed in the Instruction to Bidders and, where applicable, the name of the installing subcontractor. The Architect will promptly reply in writing to the Contractor stating whether the Owner or the Architect have any reasonable objection to any such proposal. If adequate data on any proposed manufacturer or installer is not available, the Architect may state that action will be deferred until the Contractor provides further data. Failure of the Owner or the Architect to

reply promptly shall not constitute a waiver of any of the requirements of the Contract Documents and all products furnished by the listed manufacturer must conform thereto.

3.4.1.2 Products are generally specified by ASTM and other reference standard, and/or by manufacturer's name and model number or trade name. When specified only by reference standard, the Contractor may select any product meeting this standard, by any manufacturer. When several products or manufacturers are specified as being equally acceptable, the Contractor has the option of using any product and manufacturer combination listed, but may not substitute others except as provided in Paragraph 4.4.1.3 below. When only one product and manufacturer is Specified, this is the basis of the Contract, without substitution or exception.

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

The request complies with requirements of Section 016000 and Section 012500 and additionally complies with the following:

The request is accompanied by complete data on the proposed substitution substantiating compliance with the Contract Documents including product identification and description, performance and test data, references and samples where applicable, and an itemized comparison of the proposed substitution with the products specified with data relating to Contract time schedule, design and artistic effect where applicable, and its relationship to any separate contracts."

The request is accompanied by accurate cost data on the proposed substitution with the product specified, whether or not modification of the Contract sum is to be a consideration.

3.4.1.4 By making requests for substitutions based on Paragraph 3.4.1.3 above, when forwarded by the Contractor to the Architect, the Contractor:

Represents that he has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified. Will provide the same guarantee for the substitution that he would for that specified.

Certifies that the cost data presented is complete and includes all related costs under this Contract but excludes costs under any separate contracts and the Architect's redesign costs, and that he waives all claims for additional costs related to the substitution which subsequently become apparent.

Will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

States that the proposed substitution is in full compliance with the Contract Documents and applicable codes.

Will provide a list of other trades, (if any), which may be affected by the substitution. Shall be responsible for any effect upon related work in the Project of any substitution and shall pay any additional costs generated by any substitutions.

3.4.1.5 Substitutions will not be considered if:

They are indicated or implied on Shop Drawings, Product Data or Sample submissions without the formal request required in paragraph 3.4.1.3 above.

For their implementation, they require a substantial revision of the Contract Documents or work of the owner or separate Contractors in order to accommodate their use.

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 herein and in the Contract Documents. By making request for substitution, the Contractor (a) 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; (b) represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified; (c) certifies that the cost data presented is complete and includes all related costs under this Contract but excludes cost under separate contracts and excludes the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and (d) will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

3.5 WARRANTY

3.5.2 Guarantees:

Contractor shall guarantee all work performed under this Contract as specified, delivering written guarantees to Owner, through Architect, upon completion in accordance with Section 017000.

For the convenience of the General Contractor, the following is a summary including, but not limited to, releases, warranties, and the guarantees mentioned in the various Section of these Specifications to be furnished to the Owner, through the Architect, upon completion of the Project. Where the requirements listed herein conflict with those in the various sections of these Specifications, the stricter requirements will take precedence.

General Contractor's notarized affidavit that all bills for labor and materials have been paid in full.

General Contractor's guarantee for ONE YEAR FROM DATE OF FINAL ACCEPTANCE OF THE WORK against defective materials and/or workmanship.

Roofing subcontractor shall furnish a TEN YEAR written certificate guaranteeing that all roofing materials are installed in accordance with Plans and specifications, that all roofing work is free from faulty 'materials and workmanship, that pitch will not leak or drip or stain any part of the building, and providing for repair and replacement of any faulty materials and/or workmanship.

The Flashing subcontractor's guarantee for a period of FIVE YEARS against defective materials and/or workmanship.

Caulking subcontractor's guarantee for a period of TWO YEARS from the date of final acceptance of the work.

Electrical subcontractor's guarantee for a period of ONE YEAR from time his work is accepted, against defective materials and/or workmanship.

All other guarantees not listed above but specified in the technical portion of the Specifications shall be furnished to the Owner upon completion of the Project.

3.5.3 Without limiting any other warranty, the Contractor shall warrant for a period of twelve (12) months that the buildings shall be watertight and leak proof at every point and in every area, except where leaks can be attributed to damage to the building by external forces beyond Contractor's control. The Contractor shall, immediately upon notification by the Owner of water penetration, determine the source of water penetration and, at its own expense, do any work necessary to make the building watertight. Contractor shall also, at its own expense, repair or replace any other damaged material, finishes, and furnishings, damaged as a result of this water penetration, to return the building to its original condition.

ARTICLE 3.6 - TAXES

3.6.2 This project is exempt from state taxes. A sales tax exemption certificate may be obtained from the State Comptroller.

3.7 - PERMITS, FEES AND NOTICES

3.7.5 Upon completion of the work, Contractor shall deliver to the owner through the Architect, all required Certificates of Inspection.

3.7.6 Any reference in the Specifications text to codes, standard specifications or manufacturer's instructions shall mean the latest printed edition of each in effect at the contract date.

3.9 - SUPERINTENDENT

3.9.1 Contractor and his prime subcontractors shall employ competent superintendents and necessary assistants who shall be in attendance at the Project site during the progress of the work. The superintendents shall be satisfactory to the Architect and shall not be changed except with the consent of the Architect, unless the superintendents leave the employ of the Contractor or the prime subcontractor.

3.9.2 At the beginning of Project, Contractor shall submit, in writing, to the Architect the name of his superintendent and the names of the superintendents of his prime subcontractors, this to include a list of past projects on which each superintendent has worked or been in charge of.

3.9.3 Superintendents shall not be removed from the Project by Contractor or his prime subcontractor without written requests and approval by the Architect.

3.9.4 Superintendent shall represent Contractor and all communications given superintendent shall be as binding as if given Contractor. Important communications will be confirmed in writing. Other communications will be so confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULE

3.10.3 The progress schedule shall be of a type similar to the CPM, PERT, DYliA-PERT schedules or their equivalent in the opinion of the Architect. The number of activities and structure of the progress schedule shall be adequate to explain the various stages of construction. Completed progress schedule shall be submitted to Architect no later than thirty (30) calendar days after date of Agreement and shall be updated during construction as required to keep it current. Nothing in this requirement shall be deemed to be usurpation of the Contractor's authority and responsibility to plan and schedule the work as he sees fit, subject to all other requirements of the Contract Documents.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.11 Submission of Shop Drawings and Samples to Architect required for ONLY those times specifically mentioned in the Specification Sections. If Contractor submits Shop Drawings for items other than the above, Architect will not be obliged to review them. Contractor shall be responsible or procuring Shop Drawings for his own use as he may require for the progress of the work.

3.12.12 The term "shop drawing" as used herein also includes, but is not limited to, fabrication, erection, layout and setting drawings, manufacturer's standard drawings, descriptive literature, catalogues, brochures, performance and test data, wiring and control diagrams, all other drawings and descriptive data pertaining to materials, equipment or systems and the position thereof conforms to the Contract requirements. As used herein, the term "manufactured" applied to standard units usually mass produced; and "fabricate" means items specifically assemble or made out of selected materials to meet individual design requirements. Shop Drawings shall establish the actual detail of all manufactured or fabricated items; indicate proper relation to adjoining work; amplify design details or mechanical and electrical equipment in proper relation to physical spaces in the structure; and incorporate minor changes of design or construction to suit actual conditions.

3.12.13 Following Contractor's review and approval, he shall submit to the Architect shop drawings and submittals in the quantities listed in Section 01300. Architect, at Owner's expense, will make prints for himself, Owner and Project Representative and then return the reproducible copy to Contractor in order that as many additional prints may be made, at Contractor's expense, as he may require for the remaining parties concerned.

3.12.14 Manufacturers instructions: Where any item of work is required by specification to be furnished, installed or performed in accordance with a specified product manufacturer's instructions, contractor shall procure and distribute the necessary copies of such instructions to all concerned parties.

3.12.15 Materials in the Specifications may be followed by the words "or as approved by the Architect". In these cases, wherever the name or brand of a manufacturer's article is specified, it is used as a measure of quality and utility or a standard. If Contractor desires to use any other brand or manufacturer of same quality, appearance and utility to that specified, he shall request substitution as provided in paragraph 4.4.

3.13 USE OF THE SITE

3.13.2 The Contractor shall arrange and maintain material and equipment in orderly manner keeping walks, drives, roads and entrances unencumbered.

3.15 CLEANING UP

3.15.3 Besides the "broom cleaning", the following special cleaning is required just prior to acceptance:

Remove stains; wash and polish glass, inside and outside. This work shall be done by persons skilled and equipped for such work.

Remove foreign matter, marks, stains, foreign paint, fingerprints, soil and dirt from (and have in a polished condition where appropriate) the following:
Painted, decorated and stained work.

All hardware, fixtures and incorporated equipment.

All finished surface and metal surfaces, whether interior or exterior.

All doors and windows.

3.15.4 In addition to clean-up provisions of the Specifications, Contractor shall take appropriate steps to prevent air-borne dust due to work under this contract. Water shall be applied wherever practical to settle and hold dust to a minimum, particularly during the excavation and moving of materials.

3.18 INDEMNIFICATION

3.18.3 The obligations of the Contractor under this paragraph 3.18.3 shall not extend to the liability of the Architect, his agents or employees arising out of (1) the preparation of approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications or (2) the giving of direction or instructions by the Architect, his agents or employees provided such giving is the primary cause of the injury or damage.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

4.2 ARCHITECT’S ADMINISTRATION OF THE CONTRACT

The term 'aesthetic effect' as used herein refers to color, texture, profile and juxtaposition of masses. The Architect shall be the sole interpreter of the design intent with respect to such matters, but the Architect's authority with respect thereto shall not contravene any

other rights of either the Owner or the Contractor ascribed to them by other provisions of the Contract.

ARTICLE 5 - SUBCONTRACTORS

5.5 No subcontractor shall be let until the list of proposed subcontractors as submitted at the bid opening is approved, in writing, by the Owner.

5.6 The General Contractor shall bind all Subcontractors, the Mechanical Contractor and the Electrical Contractor to the terms of the Contract Documents.

5.7 The General Contractor agrees that he is as fully responsible to the Owner or the acts and omissions of his Subcontractors and of persons either directly or indirectly employed by them as he is for the acts and omissions of persons directly employed by him.

5.8 Nothing contained in the Contract Documents shall create any contractual relations between any Subcontractor and the owner.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

6.2.7 Contractor shall be responsible for the proper fitting of all work and for the coordination of the operations of the trades, other contractors, subcontractors, and material suppliers engaged upon or in connection with the work as well as those of his own employees, and he shall exercise every effort to assure a harmonious cooperative working relationship on the part of all concerned. He shall be prepared to guarantee to each of his subcontractors and foremen all of the dimensions which they may require for the fitting of their own to adjoining work and shall do or shall cause his agents to do, all fitting and adjusting necessary to make the several parts of the work come together properly and fit the work to receive or be received by, the work of other Contractors.

ARTICLE 7 - CHANGES IN THE WORK

7.2 CHANGE ORDERS

7.2.2 Any adjustment to contract sum shall be determined by methods described in 7.3.3, 7.3.10 and 7.3.11.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3.5 In subparagraphs 7.3.3.1 and 7.3.3.3 the allowance for overhead and profit combined, included in the total cost to the Owner shall be based on the schedule in the Bid Form.

7.3.6 In allowance for overhead and profit in accordance with the schedule the Contractor is to provider – “In the Bid Form.”

7.3.10 Cost to which overhead and profit is to be applied shall be determined in accordance with subparagraph 7.3.6.

7.3.11 In order to facilitate checking of quotations for extras or credit, all proposals, except those so minor that their property can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontractors. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over $100.00 be approved without such itemization. Every change itemization shall be submitted on attached Change in work/Cost Analysis forms.

ARTICLE 8 - TIME

8.1 DEFINITIONS

8.1.5 Contract Time commences at the time of Notice to Proceed.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.4 Contractor shall have all materials delivered at the site in such quantities as required for the uninterrupted progress of the work and the least obstruction of the premises and the adjoining property. No extension of time or extra cost will be allowed for failure by Contractor to order the material on time or in insufficient quantities.

WEATHER DELAY

8.3.5 For the purpose of calculating extensions of time due to inclement weather, the local climatological data will be used.

8.3.6 Unless the Owner considers that unusual circumstances warrant consideration, extensions of time because of inclement weather will be granted for any work only to the extent that the number of days of precipitation (.04" or more) and/or the number of days of freezing weather (32 degrees and below) exceeds the mean for that month; provided that no one day will be counted more than once; and provided further, that if a day lost because of weather falls immediately before a non working day or days, such as a holiday or weekend, such working days shall be considered as lost time. The mean number of days of Precipitation and freezing weather shall be established by the tabulation of normals, means and extremes published by National Oceanic and Atmospheric Administration in the most recent Local Climatological Data for the closest reporting station to the site of the work. No claim will be considered unless it is accompanied by the attached "Time Extension Request" form completed within two weeks of the time referenced inclement period.

LIQUIDATED DAMAGES

For each day after Substantial Completion that the work remains incomplete, a penalty of $2,000.00 per day will be charged to the Contractor.

FINAL CLOSEOUT

For each day final close out is not achieved within 60 days of the scheduled Substantial Completion date, a penalty of $200.00 per day will be charged to the Contractor.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.2 All costs of overtime work require by the nature of this work, except emergencies as covered in Article 10.3.1 shall be included in the Bid.

9.3 APPLICATIONS FOR PAYMENTS

9.3.1 In each Application for Payment, the Contractor shall certify that such Application for Payment represents a just estimate of cost reimbursable to the Contractor and also shall certify as follows:

(a) There are no known mechanic's or materialmen's liens outstanding at the date of this requisition, that all due and payable bills with respect to the Work have been paid to date or are included in the amount requested in the current application, and that, except for such bills not paid but so included, there is no known basis for the filing of any mechanic's or materialmen's liens on the Work, and that waivers from all Subcontractors and materialmen's have been obtained in such form as to constitute an effective waiver of lien under the laws of the location of the Project.

(b) The Contractor shall within thirty (30) days of receipt of notice of the existence of any lien filed against the Project by any subcontractor, supplier of materials or any other person or entity claiming to be a creditor of the Contractor, cause the same to be removed as of record or provide a bond to indemnify or a cash deposit to the Title Company in an amount equal to the lien.

9.3.1.3 Along with the Progress Schedule, specified herein before, Contractor shall submit to Architect a schedule of the anticipated amount of each monthly payment that will become due the Contractor in accordance with the Progress Schedule. On or about the tenth of each month, the Owner agrees to pay to the Contractor an amount to be determined by taking ninety percent (90%) of the value of labor and materials incorporated in the work, plus material not incorporated in the work, but approved by the Architect under the provisions of the Contract Documents, up to the date of payment proposed to be made, less the aggregate of all previous payments and deductions provided for in the Contract Documents.

The five percent (5%) retention shall be paid thirty-five (35) calendar days after the date of recording by the Owner of the Notice Completion of all the work to be done under this contract, providing there are no undercharged or unsecured liens, attachments or claims in connection with the work.

9.3.2 Payments made on account of materials not incorporated in the work shall only be made on material which has been worked to a special design according to the Drawings and specifications. No payment shall be made on standard manufactured items. The Architect's decision as to which category a specific item qualifies under shall be final.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion. Triumph Public Highschool, Mercedes, Texas.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.8 Protection of Plant Life: Solvents, oils and any other material which may be harmful to plant life shall be disposed of in containers as directed by the Architect and removed from the site. At completion of work, any contaminated soil shall be removed and replaced with good soil by this Contractor at no expense to the Owner.

10.2.9 The Contractor shall secure and pay for all necessary permits and shall comply with all ordinances pertaining to his work. He shall provide and maintain suitable temporary walkways, where needed, fences and other structures required by law and city ordinances in such a manner as not to interfere with traffic in public streets. He shall leave access to fire hydrants and protect the public and adjacent property at all times during the progress of the Contract. The proper signs shall be posted at truck entrances, and all other possible safety precautions observed.

10.2.10 The Contractor shall, as a cost of the Work, provide and maintain in good order, any firefighting equipment required by local authorities during Contract operations.

10.2.11 The Contractor shall immediately report to the Owner all accidents arising out of the Work and involving injury to employees of the Contractor, any member of the public or property damage to the property. The Owner's liability insurance will not be responsible for claims, accidents and losses arising out of the Contractor's operations.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTORS LIABILITY INSURANCE

11.1.1.8 The liability insurance required shall be on a comprehensive basis, including:

Premises - Operations

Independent Contractor's Protective

Products and Completed Operations.

Add the following to Paragraph 11.1.2:

1. Workmen's Compensation - Statutory
Employer's Liability - $1,000,000 per accident, $1,000,000 disease policy limit, $1,000,000 disease each employee.

2. Commercial General Liability - $5,000,000 combined single limit, policy aggregate $1,000,000 combined single limit each occurrence.

3. Automobile Liability:

   a. Bodily injury - $ 1,000,000 each person,
   $ 1,000,000 each occurrence,

   b. Property damage - deductible not to exceed $500 per occurrence

4. Independent Contractors: Same limits as above.

5. Products and Completed Operations: same limits as above for one year, commencing with issuance of the Final Certificate for Payment.

6. Contractual Liability: Same limits as above.

7. Umbrella Liability: $5,000,000 each occurrence, $5,000,000 policy aggregate.

8. Builder's All Risk: The Contractor shall provide and maintain Builder's All Risk Insurance in the amount sufficient to cover the total value of the entire Project and existing structures on a replacement cost basis. With minimum coverage consisting of fire, extended coverage, vandalism, and malicious protection sufficient to amply indemnify himself, the Owner, and the Architect against loss or damage that may occur to the premises and improvements supplied by the Contractor until final completion and acceptance by the Owner.

11.1.3.1 Furnish one copy of the Certificates herein required for each copy of the Agreement; specifically set forth evidence of all coverage required by paragraphs 11.1.1 and 11.1.2. The form of the Certificate shall be AIA Document G705. Furnish the owner copies of any endorsements that are subsequently issued amending.

11.4 PERFORMANCE BOND AND PAYMENT BOND

Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2 CORRECTION OF WORK

Add the following to Paragraph 12.2.2:

The above-stated ONE-YEAR guarantee by the General Contractor may be extended to longer periods if stated in the Specific Section of the Specifications".

Substitute "Date of Final Acceptance of the Project" in lieu of "Date of Substantial Completion" or "Substantial Completion". The date of Final Acceptance shall be the date of the Final Application of Payment is approved by the Architect.

12.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

Add the following after Paragraph 12.3.1:

"Appropriate reduction" is hereby defined as an amount equal to the entire cost of replacing the work to make it as originally shown or specified.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 AHERA

Pursuant to Federal Public Law 99-519, otherwise known as the Asbestos Hazard Emergency Response Act (AHERA) there shall be no asbestos-containing products and/or materials used in this project.

OTHER CONDITIONS OR PROVISIONS

Contractor understands and agrees that time is of the essence hereof and in order to comply with Article 3 and meet all applicable completion dates, Contractor warrants and represents that Contractor will undertake proper coordination of the Work so as to not interfere, disrupt, delay or adversely affect in any way the on-going business functions and operations of the owner. Contractor understands and agrees that in order to comply herewith, it may be necessary for work to continue under this Contract on holidays, weekends and other calendar days on which Work is not ordinarily performed; cost of which shall be by the Contractor.

All risk insurance described in Article 11, Section 11.3.1.1 shall be purchased and carried by the contractor. The additional cost for this insurance will be paid by the Owner.

The term Products is utilized throughout this Specification Manual to encompass the many other words often used in specifications they are defined in the paragraph below:

1. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work, but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

2. Furnish or Supply: To supply and deliver, unload, inspect for damage.

3. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, and ready for use.

4. Provide: To furnish or supply, plus install.

END OF DOCUMENT

December 1, 2023

Frances Berrones-Johnson
Triumph Public High School
1218 South Presa
San Antonio, Texas 78210

Subject: **Limited Lead-in-Drinking Water Survey Report**
Grace Point Church
221 Oak Street
Abilene, Texas 79602
AEI Project No. 486170

Dear Mr. Johnson:

This letter report summarizes the findings of the Lead-in-Drinking Water Survey for the Grace Point Church building located at 221 Oak Street in Abilene, Texas. AEI Consultants (AEI) was contracted by Triumph Public High School (Client) to conduct the above-referenced services.

The subject property is a religious facility, one story structure located at 221 Oak Street in Abilene, Texas. The property was built in 1976 and is approximately 10,500 SF. The interior building materials consist of drywall sheetrock, ceiling tiles, laminate flooring, carpet over the concrete, and ceramic floor tile. The exterior of the building consisted of bricks and stucco walls in addition to glass doors and windows.

Mr. Fadi Malakieh, of AEI, performed the Lead-in Drinking Water inspection on November 20, 2023.

Note: Per the client request the water sampling was limited to the north portion of the building.

Summary of Findings

A total of ten (10) samples were collected from five (5) sources on November 20, 2023. Based on the laboratory analysis report, none of samples collected, exceeded the United States Environmental Protection Agency (USEPA) regulatory limit. No further action required.

The USEPA has a maximum allowable amount of lead in drinking water as 15 parts per billion (15 ppb) or 15 micrograms per Liter (15 µg/L). The water samples were collected between approximately 10:00am and 12:00pm. First-draw samples of 250 milliliters (250 mL) were obtained by collecting the water in a laboratory provided sample container immediately after opening the water source. Following the collection of first-draw samples, water was allowed to run for approximately 3 minutes and then a second-draw sample of 250 mL was obtained.

The samples were transported under Chain of Custody documentation to EMSL in Cinnaminson, NJ for lead in water analyses via EPA Method 200.8. Please refer to the attached *Lead in Drinking Water Sampling Results* provided in Attachment A. Below is a list of the results from the sampling events dated October 12, 2023:

Sample No.	Sample Amount	Sampling Area	Results	USEPA/HUD Clearance Levels
LDW-01	250 ml	1st Draw-Water Fountain Entrance East	1.20 µg/L	15 µg/L
LDW-02	250 ml	2nd Draw- Water Fountain Entrance East	<1.00	15 µg/L
LDW-03	250 ml	1st Draw-Men's Restroom	2.49 µg/L	15 µg/L
LDW-04	250 ml	2nd Draw-Men's Restroom	<1.00	15 µg/L
LDW-05	250 ml	1st Draw-Women's Restroom	5.48 µg/L	15 µg/L
LDW-06	250 ml	2nd Draw- Women's Restroom	<1.00	15 µg/L
LDW-07	250 ml	1st Draw-Community Room	**1.30 µg/L**	15 µg/L
LDW-08	250 ml	2nd Draw-Community Room	<1.00	15 µg/L
LDW-09	250 ml	1st Draw-Student Room	<1.00	15 µg/L
LDW-10	250 ml	2nd Draw-Student Room	<1.00	15 µg/L

Because of the limitations stated above, the findings, observations, conclusions, and recommendations expressed by AEI in this report are limited to the information obtained and the surface investigation undertaken and should not be considered an opinion concerning the compliance of any past or current owner(s) or operator(s) of the Site with any Federal, State, or local laws or regulations. No warranty or guarantee, whether express or implied, is made with respect to the data reported or findings, observations, conclusions, or recommendations expressed in this report. Furthermore, such data, findings, observations, conclusions, and recommendations are based solely upon Site conditions in existence at the time of investigation. The sample analytical results are only valid for the time and place of collection and AEI does not warrant that these results will be repeatable or are representative of past or future conditions.

This assessment was performed at the request of Triumph Public High School, its successors, and assigns ("Client") utilizing methods and procedures consistent with good commercial or customary practices designed to conform with acceptable industry standards. This report may be distributed to and relied upon by Client and its current and future wholly and partially owned subsidiaries, affiliates, successors, and assigns. The independent conclusions represent AEI Consultants' best professional judgment based on the conditions that existed and the information and data available to us during the course of this assignment. Factual information regarding operations, conditions, and test data provided to Client, Reliant Party, or their representative has been assumed to be correct and complete.

This report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the Agreement and the provisions thereof.

The recommendations and conclusions presented as a result of this survey apply strictly to the environmental regulations and property conditions existing at the time the study was performed.

Please feel free to contact Mr. John Copman at (732) 312-4508 if you have any questions.

Sincerely,

Fadi Malakieh
Senior Project Manager
AEI Consultants
15660 Dallas Parkway
Dallas, TX 75248

Reviewed by:

Senior Project Manager
AEI Consultants
4255 Wade Green Road, Suite 510
Kennesaw, Georgia 30144

Attachments

Attachment A: Lead in Water Sampling Analytical Results

Attachment A

Lead in Water Sampling Analytical Results

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012365889
LIMS Reference ID: AB65889
EMSL Customer ID: ACON78

Attention: Fadi Malakieh
AEI Consultants [ACON78]
4514 Cole Avenue, Suite 600
Dallas, TX 75205
(214) 393-5810
fmalakieh@aeiconsultants.com

Project Name: 486170-221 Oak Street Abilene TX 79602

Customer PO: 351697
EMSL Sales Rep: Chris Nardozzi
Received: 11/22/2023 09:50
Reported: 12/01/2023 13:50

Analytical Results

Analyte	Result	Q	DF	RL	Units	Prepared Date/Time	Analyzed Date/Time	Analyst Initials	Prep /Analytical Method
Sample: LDW-01/Water Fountain / entrance East			**Lims Reference ID:**	**AB65889-01**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:30:00**
Metals									
Lead	**1.20**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:08	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-02/Water Fountain / entrance East			**Lims Reference ID:**	**AB65889-02**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:30:00**
Metals									
Lead	**<1.00**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:10	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-03/Men's Restroom			**Lims Reference ID:**	**AB65889-03**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:39:00**
Metals									
Lead	**2.49**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:17	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-04/Men's Restroom			**Lims Reference ID:**	**AB65889-04**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:39:00**
Metals									
Lead	**<1.00**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:19	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-05/Women's Restroom			**Lims Reference ID:**	**AB65889-05**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:46:00**
Metals									
Lead	**5.48**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:22	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-06/Women's Restroom			**Lims Reference ID:**	**AB65889-06**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:46:00**
Metals									
Lead	**<1.00**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:24	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-07/Room 9/Community Room			**Lims Reference ID:**	**AB65889-07**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:55:00**
Metals									
Lead	**1.30**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:26	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-08/Room 9/Community Room			**Lims Reference ID:**	**AB65889-08**	**Matrix: Drinking Water**				**Sampled: 11/20/23 10:55:00**
Metals									
Lead	**<1.00**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:28	ZZZ	EPA 200.8 (DA)/EPA 200.8
Sample: LDW-09/Room 15/Student Room			**Lims Reference ID:**	**AB65889-09**	**Matrix: Drinking Water**				**Sampled: 11/20/23 11:06:00**
Metals									
Lead	**<1.00**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:35	ZZZ	EPA 200.8 (DA)/EPA 200.8

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012365889
LIMS Reference ID: AB65889
EMSL Customer ID: ACON78

Attention: Fadi Malakieh
AEI Consultants [ACON78]
4514 Cole Avenue, Suite 600
Dallas, TX 75205
(214) 393-5810
fmalakieh@aeiconsultants.com

Project Name: 486170-221 Oak Street Abilene TX 79602

Customer PO: 351697
EMSL Sales Rep: Chris Nardozzi
Received: 11/22/2023 09:50
Reported: 12/01/2023 13:50

Analytical Results
(Continued)

Analyte	Result	Q	DF	RL	Units	Prepared Date/Time	Analyzed Date/Time	Analyst Initials	Prep /Analytical Method
Sample: LDW-10/Room 15/Student Room			**Lims Reference ID: AB65889-10**		**Matrix: Drinking Water**				**Sampled: 11/20/23 11:06:00**
Metals									
Lead	**<1.00**		1	1.00	µg/L	11/24/23 15:48	11/24/23 17:37	ZZZ	EPA 200.8 (DA)/EPA 200.8

EMSL Analytical, Inc.

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Reported: 12/01/2023 13:50

Certified Analyses included in this Report

Analyte	Certifications
EPA 200.8 in Drinking Water	
Lead	NJDEP

List of Certifications

Code	Description	Number	Expires
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2023
NYSDOH	New York State Department of Health	10872	04/01/2024
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2024
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2024
CTDPH	Connecticut Department of Public Health	PH-0270	06/23/2024
California ELAP	California Water Boards	1877	06/30/2024
AIHA LAP	EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC-ELLAP Accredited	100194	01/01/2025
A2LA	A2LA Environmental Certificate	2845.01	07/31/2024

Please see the specific Field of Testing (FOT) on www.emsl.com <http://www.emsl.com> for a complete listing of parameters for which EMSL is certified.

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012365889
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Project Name: 486170-221 Oak Street Abilene TX 79602

Customer PO: 351697
EMSL Sales Rep: Chris Nardozzi
Received: 11/22/2023 09:50
Reported: 12/01/2023 13:50

Notes and Definitions

Item	Definition
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the detection limit.
Q	Qualifier
RL	Reporting Limit

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

Owen McKenna Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted."

EMSL ANALYTICAL, INC.
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Lead Chain of Custody

EMSL Order Number / Lab Use Only

AB65889

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: c@emsl.com

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	AEI Consultants	Company Name:	AEI Consultants
Contact Name:	Fadi Malakieh	Billing Contact:	Fadi Malakieh
Street Address:	4514 Cole Avenue, Suite 600	Street Address:	15660 Dallas Parkway Suite 820
City, State, Zip:	Dallas TX 75205	City, State, Zip:	Dallas TX 75248
Country:	US	Country:	US
Phone:	214-393-5810	Phone:	469-486-0100
Email(s) for Report:	fmalakieh@aeiconsultants.com	Email(s) for Invoice:	

Project Information

Project Name/No:	486170-221 Oak Street Abilene TX 79602	Purchase Order:	351697
EMSL LIMS Project ID: (If applicable, EMSL will provide)		US State where samples collected:	TX
State of Connecticut (CT) must select project location:	☐ Commercial (Taxable) ☐ Residential (Non-Taxable)		
Sampled By Name:		Sampled By Signature:	
No. of Samples in Shipment			

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☐ 48 Hour ☐ 72 Hour ☑ 96 Hour ☐ 1 Week ☐ 2 Week

Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

MATRIX	METHOD	INSTRUMENT	REPORTING LIMIT	SELECTION
CHIPS ☐ % by wt. ☐ ppm (mg/kg) ☐ mg/cm²	SW 846-7000B	Flame Atomic Absorption	0.008% (80ppm)	☐
*Reporting Limit based on a minimum 0.25g sample weight	SW 846-6010D*	ICP-OES	0.0004% (4ppm)	☐
AIR	NIOSH 7082	Flame Atomic Absorption	4µg/filter	☐
	NIOSH 7300M / NIOSH 7303M	ICP-OES	0.5µg/filter	☐
	NIOSH 7300M / NIOSH 7303M	ICP-MS	0.05µg/filter	☐
WIPE ☐ ASTM ☐ NON-ASTM	SW 846-7000B	Flame Atomic Absorption	10µg/wipe	☐
*If no box is checked, non-ASTM Wipe is assumed	SW 846-6010D*	ICP-OES	1.0µg/wipe	☐
TCLP	SW 846-1311 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1311 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
SPLP	SW 846-1312 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1312 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
TTLC	22 CCR App. II, 7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
STLC	22 CCR App. II, 7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
Soil	SW 846-7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
Wastewater	SM 3111B / SW 846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.7	ICP-OES	0.020 mg/L (ppm)	☐
Drinking Water	EPA 200.5	ICP-OES	0.003 mg/L (ppm)	☐
Unpreserved ☑ / Preserved with HNO3 ☐ PH<2	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter	☐
Other:				☐

	Sample Number	Sample Location	Volume / Area	Date / Time Sampled
1	LDW-01	Water Fountain/entrance East	250ml	11-20-23 10:30AM
2	LDW-02	" " "	"	" "
3	LDW-03	Men's Rest Room		10:39AM
4	LDW-04	" "		10:39AM
5	LDW-05	Women's Rest Room		10:46AM

Method of Shipment:	FedEx	Sample Condition Upon Receipt:	
Relinquished by:	Fadi Malakieh	Date/Time: 11-21-23 9AM	Received by: Colleen Palladino
Date/Time:	11/22/23 9:50		
Relinquished by:	Fadi Malakieh	Date/Time: 11-21-23 9AM	Received by:
Date/Time:			

Controlled Document - COC-25 Lead R15 4/19/2021

*6010C Available Upon Request

recid preserved

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

EMSL ANALYTICAL, INC.
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EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: c@emsl.com

Lead Chain of Custody

EMSL Order Number / Lab Use Only

AB65889

Additional Pages of the Chain of Custody are only necessary if needed for additional sample information

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

	Sample Number	Sample Location	Volume / Area	Date / Time Sampled
6	LJW-06	Women's Rest Room	250ml	11-20-23 10:46AM
7	LJW-07	Room 9 / Community Room	↓	10:55AM
8	LJW-08	Room 9 / Community Room	↓	10:55AM
9	LJW-09	Room 15 / Student Room	↓	11:06AM
10	LJW-10	Room 15 / Student Room	↓	11:06AM

Method of Shipment: FedEx		Sample Condition Upon Receipt:	
Relinquished by: Fadi Malhas	Date/Time: 11-21-23 9AM	Received by:	Date/Time
Relinquished by:	Date/Time: 11-21-23 9AM	Received by:	Date/Time

Controlled Document - COC-25 Lead R16 4/19/2021

☐ **AGREE TO ELECTRONIC SIGNATURE** (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

Limited NESHAP Pre-Renovation Asbestos Survey Report

REPORT DATE: November 30, 2023

PROPERTY INFORMATION
221 Oak Street
Abilene, Texas 79602

PROJECT INFORMATION
AEI Project No. 486170
Site Assessment Date: November 20, 2023

PREPARED FOR
Triumph Public High Schools
1218 South Presa
San Antonio, Texas 78210

PREPARED BY
AEI Consultants – Dallas Office
4514 Cole Avenue, Suite 600
Dallas, Texas 75205

1.800.801.3224
www.aeiconsultants.com

November 30, 2023

Frances Berrones-Johnson
Triumph Public High Schools
1218 South Presa
San Antonio, Texas 78210

Subject: Limited NESHAP Pre-renovation Asbestos Survey Report
221 Oak Street, Abilene, Texas 79602
Project No. 486170

Dear Mr. Johnson,

AEI Consultants, Inc. (AEI) was retained by Triumph Public High School (Client) to conduct a National Emission for Hazardous and Air Pollutants (NESHAP) limited asbestos survey for the property located at 221 Oak Street in Abilene, Texas. The survey was conducted on November 20, 2023, by Mr. Fadi Malakieh, a Texas Department of State Health Services (TDSHS) licensed asbestos consultant. The purpose of the survey was to locate, identify, sample, and assess the condition of building materials suspected of containing asbestos.

Sincerely,

Fadi Malakieh
Senior Project Manager
4514 Cole Avenue, Suite 600
Dallas, Texas 75205
Phone: 469-486-0100
Email: fmalakieh@aeiconsultants.com

TABLE OF CONTENTS

1.0 INTRODUCTION

This report documents the methods and findings of the limited NESHAP Pre-renovation asbestos survey for the property located at 221 Oak Street in Abilene, Texas.

1.1 Scope of Work

The purpose of the survey was to locate, identify, sample, and assess the condition of building materials suspected of containing asbestos.

The survey was performed on November 20, 2023, by Mr. Fadi Malakieh, a Texas Department of State Health Services (TDSHS) licensed asbestos consultant (license No. 10-5732, Expiration Date: 2/7/2025). AEI Certifications are provided as Appendix A to this report. The asbestos inspection was performed in conformance with modified protocols set forth by the Environmental Protection Agency (EPA) Asbestos Hazard Emergency Response Act (AHERA), NESHAP and in accordance with state regulations.

1.2 Site Specific Survey Limitations

The data presented and the opinions expressed in this report are qualified as follows:

- The survey encompassed the interior, exterior, and roof. Below-grade of the structure or foundation walls were excluded in the survey. **The survey was limited to the north portion of the building.**
- The sole purpose of the investigation and of this report was to assess the Site with respect to asbestos materials as defined in AEI's Scope of Work and the applicable State, Federal, and local environmental laws, and regulations.
- The Scope of Services was defined by the request of the Client, the time and budgetary constraints imposed by the Client, and the availability of access to the Site.
- The collection of bulk building material samples for analysis is a destructive procedure and may cause damage to the integrity of building systems. AEI took normal precautions to minimize damage, however, AEI will not be held responsible for damage to the building systems as a result of sample collection.

1.3 NESHAP Regulations and Guidelines

The Code of Federal Regulations (CFR), 40 CFR 61, Subpart M, NESHAP, classifies ACM as any material or product that contains >1% asbestos. As suspect ACM is identified, it is classified as either friable or non-friable.

Friable materials are more hazardous than non-friable materials since they are more likely to release fibers into the air. Friable is defined as any ACM that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Non-friable ACM is classified as either Category 1 or Category 2 material as follows:

- **Category 1** – Asbestos containing packings, gaskets, resilient floor coverings and asphalt roofing products; and

- **Category 2** – All remaining types of non-friable asbestos containing material not included in Category 1 that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Regulated asbestos containing materials (RACM), a hazardous waste when friable, is classified as any manufactured material that contains >1% asbestos and is:

1. Friable – The material can be crumbled, pulverized, or reduced to powder by hand pressure,
2. Category 1 that are subjected to sanding, grinding, cutting, or abrading,
3. Category 1 material that has become friable during renovation activities, or
4. Category 2 material that has become friable during renovation activities.

Materials containing >1% asbestos are subject to the NESHAP regulations (40 CFR Part 61, Subpart M). RACM (friable ACM and non-friable ACM that will become friable during renovation/demolition operations) must be removed from structures prior to renovations or demolitions. Certain non-friable ACM and materials containing 1% or less asbestos may remain in structures during renovations/demolitions.

Per federal regulations, if the materials to be impacted by renovation or demolition projects are found to contain asbestos but at concentration of less than one percent (<1%) by weight, these materials are classified as containing "trace asbestos." The US EPA's NESHAP for Asbestos (40 CFR § 61, subpart M) Regulations do not apply to materials containing <1% asbestos. However, OSHA's Asbestos Construction Standard (29 CFR § 1926.1101) applies regardless of the amount of asbestos present. Some of the requirements of the OSHA Asbestos Construction Standard are summarized below.

If a material to be impacted by a renovation/demolition project contains asbestos at a concentration of <1% (trace asbestos) the following actions must be taken:

- An Asbestos Exposure Assessment must be made specific to the work to be performed.
- All applicable work practices in the OSHA Standard must be implemented.
- All applicable prohibitions in the OSHA Standard must be adhered to.
- If either the permissible exposure limit (PEL) is exceeded or a negative exposure assessment (NEA) is not available, all applicable requirements of the OSHA Standard must be adhered to.
- All other applicable laws, rules, and regulations must be followed.

2.0 SITE DESCRIPTION

The subject property is a religious facility consisting of a one-story structure located at 221 Oak Street in Abilene, Texas. The building was built in 1976 and is approximately 10,500 SF. The interior building materials consist of drywall sheetrock, ceiling tiles and laminate flooring and carpet over the concrete and ceramic floor tile, the exterior of the building consists of bricks and stucco walls in addition to glass doors and windows.

3.0 METHODOLOGY

3.1Material Sampling

During the survey, AEI visually inspected all readily accessible interior, exterior, and roof areas of the subject properties and identified homogeneous areas of suspect material (materials that share the same texture, color, use, and appear to have been applied at approximately the same time) and collected representative samples of suspect material for laboratory analysis. The samples collected were placed in plastic bags, sealed, labeled, and transported under chain of custody documentation to an accredited laboratory.

A representative number of samples were collected for each Homogeneous Area in accordance with the following:

T = Thermal System Insulation

M = Miscellaneous Materials

S = Surfacing Materials (Troweled or Spray-Applied)

Bulk material samples were collected in 4-mil plastic bags, or through the use of sample coring devices in sealed plastic tubes and sealed for transport to the laboratory. Each sample collected was assigned its own unique coded number. Samples were collected, analyzed, and stored under strict chain-of-custody protocol.

AEI's approach included a visual assessment of the spaces to locate, as far as practicable, suspect ACM in interior and exterior building or structure locations. Suspect materials were divided into "Homogeneous Areas", building materials which were determined by the inspector to be similar based on their color, texture, and age. In addition, Homogeneous Areas were identified in some cases by function or use, by size, or area/location of the material as well as color, texture, and age or type of material.

Mechanical and electrical equipment including, but not limited to, boilers, HVAC units, refrigeration units, etc. may have internal parts that are asbestos containing. In some cases, these materials where applicable were assumed to contain asbestos where no prior information related to sampling of these materials was provided or due to the inaccessible nature of the materials for sampling. Prior to renovation or demolition, internal components should be inspected or assumed to contain asbestos.

3.2 Analytical Methods

All samples collected were transported under Chain of Custody documentation to Moody Labs in Farmers Branch, Texas for analysis. SMMS is accredited by the National Voluntary Laboratory Accreditation Program and licensed by Texas Department of State Health Services for PLM analysis (TDSHS License number: 300084). The bulk samples were analyzed via Polarized Light Microscopy (PLM) in accordance with U.S. Environmental Protection Agency (EPA) Method 600/R-93/116. Laboratory certifications are provided as Appendix B of this report.

All bulk suspect asbestos samples were analyzed using polarized light microscopy (PLM) in accordance with the EPA "Method of Determination of Asbestos in Bulk Samples" (EPA 600/R-93/116, July 1993). This method is referred to as the "Improved Method" and is recommended by EPA as a preferred substitute to the Interim Method EPA 600/M4-82-020, 1982. The

laboratory analytical report is included as Appendix C to this report. It should be noted that some materials are multi-layered and are inseparable during the bulk sample collection process. Each layer requires specific analysis and reporting by layer (each layer = 1 sample analysis).

In accordance with U.S. EPA guidelines, samples are categorized into "homogeneous groups" by material type. The number of samples to be taken for each group is dictated by the type and quantity of the material. All samples within the homogeneous group must be less than 1% asbestos in order to classify the material as "non-asbestos." Conversely, the positive result of any single (1) sample dictates that the Homogeneous Group be classified as ACM. Thus, when the individual samples of each homogeneous group are analyzed, the laboratory will discontinue analysis when asbestos has been identified in one (1) of the samples. These subsequent samples, which have not yet been analyzed, are reported as NA/PS ("Not Analyzed/Positive Stop") and the homogeneous material is classified as an ACM. Positive Stop procedures are economically beneficial by reducing unnecessary analytical cost for repetitive analysis.

3.3 Limitations and Service Constraints

- AEI was granted full access within the subject property. Discrete sampling procedures were utilized on request of the client. Access to all interior and exterior spaces including the roof of the north potion of the building was granted by the property management.
- Due to the hidden nature of some building materials, AEI attempted to access all suspect materials for sampling through limited destructive inspection methods.
- The inspection of every space or void (inside walls, ceilings, chases, etc.) within a building's structure is not feasible or cost effective. Therefore, reasonable attempts were made to investigate a representative number of locations, which allows for assumptions to be made regarding typical construction of the investigated building/areas.
- Where concrete or wood substrates were encountered below floor finishes or behind wall finishes, they were considered to be the lowest flooring substrate or outer wall substrate. No coring through identified concrete or wood substrates was performed as part of this survey.
- Mechanical and electrical equipment including, but not limited to, boilers, HVAC units, refrigeration units, etc. may have internal parts that are asbestos-containing. No investigation inside active equipment was performed.
- An inspection below grade on the buildings foundation or other Site areas was not performed as part of AEI's scope of work.
- AEI derived the data in this report primarily from visual inspections, interviews with individuals with information about the Site and a limited number of environmental samples. The passage of time, manifestation of latent conditions, or occurrence of future events may require further exploration at the Site, analysis of the data, and re-evaluation of the findings, observations, conclusions, and recommendations expressed in the report.
- In preparing this report, AEI has relied upon and presumed accurate certain information (or absence thereof) about the Site provided by the Client, and others identified herein. Except as otherwise stated in the report, AEI has not attempted to verify the accuracy or completeness of such information.

- The data reported and the findings, observations, conclusions, and recommendations expressed in the report are limited by the Scope of Services, including the extent of environmental sampling and other tests.
- Asbestos surveys are considered destructive in that the collection of multiple bulk building material samples must be performed for subsequent laboratory analysis and may cause damage to the integrity of building systems. Multiple samples of each suspect building material are collected utilizing hand tools via chipping, cutting, gouging, coring, or scraping. Samples may vary in size depending upon the type of material(s) being collected and the location of the material. Larger samples are sometimes required to access layered materials (i.e., multiple layers of flooring or roofing). Repairs via patching will only be performed for friable thermal insulation materials. AEI took normal precautions to minimize damage, however, AEI will not be responsible for the minor damage caused by sampling of suspect building materials.

4.0 SAMPLING AND ANALYSIS

4.1 NESHAP Pre-demolition Asbestos Survey

A total of sixty-seven (67) bulk samples of suspect ACMs were collected from the subject property for laboratory analysis, which layered out to one hundred and fifty-four (154) during laboratory analysis. Analysis by layer is required for multi-layered materials in accordance with the analytical method.

The Homogeneous Application Designations, Material descriptions and locations, approximate quantities of any positive results, and sample location descriptions and results are listed in Table 1 below (Confirmed Positive results or Assumed Positive Materials are Highlighted):

TABLE 1
HOMOGENEOUS APPLICATION SUMMARY
221 Oak Street, Abilene, Texas

HA ID	Type of Material	Material Location	Approximate Quantity	Sample ID#	Sample Collection Location	Sample Result
01	Drywall Joint Compound Smooth Mop (White)	Entrance Area	N/A	01	East Side Entrance by Women's Restroom	None Detected
				02	East Side Entrance by Fountain	None Detected
				03	East Side Entrance by Fountain	None Detected
02	Drywall System Smooth Mop (Light Green)	Throughout the Hallway	N/A	04	Hallway North by Room 15	None Detected
				05	Hallway North West Side	None Detected
				06	Hallway North East Wall	None Detected
03	**Drywall Joint Compound (Orange Peel) (Dark Blue)**	**Throughout the Rooms**	**9,500 S.F**	**07**	**Room 11 Nursery**	**None Detected**
				08	**Room 13/3-4 Years Old**	**None Detected**
				09	**Room 9/Community Room**	**None Detected**
				10	**Room 14/5 Years/1st Grade**	**2% Chrysotile - Old Texture**

TABLE 1 HOMOGENEOUS APPLICATION SUMMARY 221 Oak Street, Abilene, Texas						
HA ID	**Type of Material**	**Material Location**	**Approximate Quantity**	**Sample ID#**	**Sample Collection Location**	**Sample Result**
				11	**Room 17/3rd Grade**	**2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture**
				12	Room 14/5 Years/1st Grade	None Detected
				13	**Room 11/Nursery**	**2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture**
04	**Drywall Joint Compound (Heavy Mop) (Blue)**	**Room 10 Pastoral Staff**	**3000 S.F**	**14**	**Room 10 Pastoral Staff**	**2% Chrysotile - Old Text / Joint Compound**
				15	**Room 10 Pastoral Staff**	**None Detected**
				16	**Room 10 Pastoral Staff**	**None Detected**
05	**Drywall System (Orange Peel) (Red)**	**Room 12/Red Room**	**2000 S.F**	**17**	**Room 12/Red Room**	**None Detected**
				18	**Room 12/Red Room**	**2% Chrysotile - Old Texture**
				19	**Room 12/Red Room**	**2% Chrysotile - Joint Compound**
06	**Drywall Joint Compound (Orange Peel) (White)**	**Room 15/Student Room**	**4500 S.F**	**20**	**Room 15/Student Room**	**2% Chrysotile - Old Texture**
				21	**Room 15/Student Room**	**2% Chrysotile - Old Texture**

TABLE 1 HOMOGENEOUS APPLICATION SUMMARY 221 Oak Street, Abilene, Texas						
HA ID	**Type of Material**	**Material Location**	**Approximate Quantity**	**Sample ID#**	**Sample Collection Location**	**Sample Result**
				22	**Room 15/Student Room**	**2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture**
07	**Drywall Joint Compound (Orange Peel) (Orange Color)**	**Room 16**	**2500 S.F**	**23**	**Room 16**	**2% Chrysotile - Old Texture**
				24	**Room 16**	**2% Chrysotile - Old Texture**
				25	**Room 16**	**2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture**
08	Carpet Mastic	Throughout		26	Room 10-Pastorial Staff	None Detected
				27	Room 12-Red Room	None Detected
				28	Room 13/3-4 Years Old	None Detected
09	12”x12” White Ceramic Floor Tile	Hallway	N/A	29	Entrance	None Detected
				30	Hallway North	None Detected
				31	Hallway North	None Detected
10	2’x4’ Ceiling Tiles Pinholes (White)	Throughout	N/A	32	Hallway North	None Detected
				33	Room 14	None Detected
				34	Room 10	None Detected
11	4” Cove Base (Brown) with Mastic (Yellow)	Room 10-Pastorial Staff	N/A	35	Room 10-Pastorial Staff	None Detected
				36	Room 10-Pastorial Staff	None Detected
				37	Room 10-Pastorial Staff	None Detected

TABLE 1 HOMOGENEOUS APPLICATION SUMMARY 221 Oak Street, Abilene, Texas						
HA ID	**Type of Material**	**Material Location**	**Approximate Quantity**	**Sample ID#**	**Sample Collection Location**	**Sample Result**
12	4" Cove Base (Black) with Mastic (Yellow)	Throughout	N/A	38	Hallway North End	None Detected
				39	Hallway North End	None Detected
				40	Room 14	None Detected
13	4" Cove Base (Red) with Mastic (Yellow)	Room 12-Red Room	N/A	41	Room 12-Red Room	None Detected
				42	Room 12-Red Room	None Detected
				43	Room 12-Red Room	None Detected
14	4" Cove Base (Silver) with Mastic (Yellow)	Room 17/2nd – 3rd Grade	N/A	44	Room 17/2nd – 3rd Grade	None Detected
				45	Room 17/2nd – 3rd Grade	None Detected
				46	Room 17/2nd – 3rd Grade	None Detected
15	12"x12" Dark Brown Ceramic Tile with Grout	Men and Women Restroom	N/A	47	Men's Restroom	None Detected
				48	Men's Restroom	None Detected
				49	Women's Restroom	None Detected
16	Exterior Red Bricks with Mortar	Exterior Throughout	N/A	50	Exterior Northeast	None Detected
				51	Exterior Northeast	None Detected
				52	Exterior Northwest	None Detected
17	Exterior Stucco/Ceiling (Beige)	Exterior Throughout	N/A	53	Exterior Northeast	None Detected
				54	Exterior Northeast	None Detected
				55	Exterior Northwest	None Detected
18	Roofing	Roof North Side End	N/A	56	Roof North Side End	None Detected
				57	Roof North Side End	None Detected
				58	Roof Middle	None Detected

TABLE 1 HOMOGENEOUS APPLICATION SUMMARY 221 Oak Street, Abilene, Texas						
HA ID	**Type of Material**	**Material Location**	**Approximate Quantity**	**Sample ID#**	**Sample Collection Location**	**Sample Result**
19	**Roof Flashing (Black)**	**Roof**	**900 L.F**	**59**	**Roof HVAC Unit West Side**	**5% Chrysotile - Flashing Tar**
				60	**Roof HVAC Unit West Side**	**5% Chrysotile - Flashing Tar**
				61	**Roof HVAC Unit East Side**	**5% Chrysotile - Flashing Tar**
20	HVAC Units Mastic (White)	HVAC Units	N/A	62	HVAC Unit West Side	None Detected
				63	HVAC Unit West Side	None Detected
				64	HVAC Unit East Side	None Detected
21	Laminate Flooring	Nursing Room and Community Room	N/A	65	Nursing Room	None Detected
				66	Nursing Room	None Detected
				67	Community Room	None Detected

N/A – not applicable,
RACM – Regulated Asbestos Containing Materials,
Results in **bold** are >1%asbestos fibers,
NA/PS (Not Analyzed/Positive Stop.
* Sample Point Counted

5.0 SUMMARY AND RECOMMENDATIONS

This report documents the methods and findings of the limited NESHAP Pre-renovation Asbestos Survey for the property located at 221 Oak Street in Abilene, Texas.

5.1 Summary of Findings

The results of the limited NESHAP Pre-renovation asbestos survey for the property located at 221 Oak Street in Abilene, Texas, Texas indicated the following building materials were **found to contain greater than one percent (>1%) asbestos, by weight, and were determined asbestos containing:**

- **Drywall / Joint Compound (Orange Peel, Dark Blue), located throughout the Classrooms. Approximately 9,500 Square Feet;**
- **Drywall / Joint Compound (Heavy Mop, Blue), located in the pastoral staff. Approximately 3000.00 Square Feet;**
- **Drywall System (Orange Peel, Red), located in the red room. Approximately 2,000.00 Square Feet;**
- **Drywall / Joint Compound (Orange Peel, White), located at the student room. Approximately 4,500 Square Feet;**
- **Drywall / Joint Compound (Orange Peel, Orange Colored), located at room 16. approximately 2,500.00;**
- **Roof Flashing (Black), located at the HVAC units and the edge of the roof. Approximately 900 Linear Feet.**

5.2 Recommendations

Based on the results of the limited NESHAP Pre-renovation asbestos survey, AEI makes the following recommendations:

1. AEI recommends that identified asbestos-containing building materials be abated prior to any renovation/demolition activities (if the activity may disturb the material). The asbestos abatement must be conducted by a State of Texas licensed asbestos abatement contractor in accordance with a project design prepared by a State of Texas licensed asbestos consultant. Third party air monitoring must be conducted during the abatement. In addition, the asbestos containing materials quantities should be verified by the abatement contractor prior to entering into any agreement for removal.

2. The owner or operator must provide the Texas DSHS with written notification of planned removal activities at least 10 working days prior to the commencement of asbestos abatement activities.

3. If suspect materials that are not referenced in this report are identified during demolition activities, AEI recommends that the materials be sampled and analyzed to confirm or deny the presence of asbestos prior to disturbance of the materials.

4. The inspection below grade on the building foundation was not performed as part of our scope of work. Prior to disturbance, all building foundations should be inspected for suspect waterproofing materials or other suspect materials.

6.0 REPORT RELIANCE

Because of the limitations stated above, the findings, observations, conclusions, and recommendations expressed by AEI in this report are limited to the information obtained and the surface and subsurface investigation undertaken and should not be considered an opinion concerning the compliance of any past or current owner(s) or operator(s) of the Site with any Federal, State, or local laws or regulations. No warranty or guarantee, whether express or implied, is made with respect to the data reported or findings, observations, conclusions, or recommendations expressed in this report. Furthermore, such data, findings, observations, conclusions, and recommendations are based solely upon Site conditions in existence at the time of investigation.

This assessment was performed at the request of the Client, its successors, and assigns ("Client") utilizing methods and procedures consistent with good commercial or customary practices designed to conform with acceptable industry standards. This report may be distributed to and relied upon by Client and its current and future wholly and partially owned subsidiaries, affiliates, successors, and assigns. The independent conclusions represent AEI Consultants' best professional judgment based on the conditions that existed and the information and data available to us during the course of this assignment. Factual information regarding operations, conditions, and test data provided to Client, Reliant Party, or their representative has been assumed to be correct and complete.

This report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the Agreement and the provisions thereof.

7.0 SIGNATURE OF ENVIRONMENTAL PROFESSIONALS

AEI Consultants has performed a limited NESHAP Pre-renovation asbestos survey for the property located at 221 Oak Street in Abilene, Texas in conformance with applicable Asbestos regulations. Any exceptions to, or deletions from, this practice are described in Sections 1.2 and 3.3 of this report.

Prepared By:

Fadi Malakieh
Senior Project Manager
AEI Consultants
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Email: fmalakieh@aeiconsultants.com

Reviewed by:

Brett Huber
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AEI Consultants
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Freehold, New Jersey 07728
Email: bhuber@aeiconsultants.com

APPENDIX A

AEI QUALIFICATIONS

Texas Department of State Health Services

ALL ENVIRONMENTAL INC

is certified to perform as an

Asbestos Consultant Agency

in the State of Texas and is hereby governed by the rights, privileges and responsibilities set forth in Texas Occupations Code, Chapter 1954 and Title 12, Texas Administrative Code, Chapter 295 relating to Texas Asbestos Health Protection, as long as this license is not suspended or revoked.

License Number: 100571

Expiration Date: 02/26/2025

Jennifer Shuford, MD, MPH,
Commissioner of Health

Control Number: 97538

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

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Texas Department of State Health Services

Asbestos Individual Consultant

FADI MALAKIEH

License No. 105732

Control No. 98155

Expiration Date: 7-Feb-2025

APPENDIX B

LABORATORY CERTIFICATIONS

United States Department of Commerce
National Institute of Standards and Technology

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 102056-0

Moody Labs, LLC

Farmers Branch, TX

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Asbestos Fiber Analysis

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

2022-07-01 through 2023-06-30

Effective Dates

For the National Voluntary Laboratory Accreditation Program

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

Moody Labs, LLC
2051 Valley View Lane
Farmers Branch, TX 75234-8956
Mr. Bruce Crabb
Phone: 972-241-8460 Fax: 972-241-8461
Email: bruce.crabb@moodylabs.com
http://www.moodylabs.com

ASBESTOS FIBER ANALYSIS — NVLAP LAB CODE 102056-0

Bulk Asbestos Analysis

Code	*Description*
18/A01	EPA -- 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples
18/A03	EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials

Airborne Asbestos Analysis

Code	*Description*
18/A02	U.S. EPA's "Interim Transmission Electron Microscopy Analytical Methods-Mandatory and Nonmandatory-and Mandatory Section to Determine Completion of Response Actions" as found in 40 CFR, Part 763, Subpart E, Appendix A.

For the National Voluntary Laboratory Accreditation Program

Texas Department of State Health Services

MOODY LABS LLC DBA
MOODY LABS

is certified to perform as an

Asbestos Laboratory

PCM, PLM, TEM

in the State of Texas and is hereby governed by the rights, privileges and responsibilities set forth in Texas Occupations Code, Chapter 1954 and Title 12, Texas Administrative Code, Chapter 295 relating to Texas Asbestos Health Protection, as long as this license is not suspended or revoked.

License Number: 300084

Expiration Date: 05/31/2024

John Hellerstedt, M.D.,
Commissioner of Health

Control Number: 96624

(Void After Expiration Date)

VOID IF ALTERED NON-TRANSFERABLE

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APPENDIX C

LABORATORY ANALYTICAL RESULTS

PLM Summary Report

Moody Labs
2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client : AEI Consultants
Project : 221 Oak Street, Abilene, TX 79602
Project # : 486170
Identification : Asbestos, Bulk Sample Analysis
Test Method : Polarized Light Microscopy / Dispersion Staining (PLM/DS)
EPA Method 600 / R-93 / 116

Lab Job No. : 23B-14001
Report Date : 11/28/2023
Sample Date :11/20/2023

On 11/20/2023, sixty seven (67) bulk material samples were submitted by Fadi Malakieh of AEI Consultants for asbestos analysis by PLM/DS. The PLM Detail Report is attached; additional information may be found therein. The results are summarized below:

Sample Number	Client Sample Description / Location	Asbestos Content
01	Drywall / Joint Compound (Smooth Mop, White), East Side Entrance by Women's Restroom	None Detected - Drywall Material None Detected - Texture / Joint Cmpd
02	Drywall / Joint Compound (Smooth Mop, White), East Side Entrance by Fountain	No Drywall Material None Detected - Joint Compound None Detected - Texture
03	Drywall / Joint Compound (Smooth Mop, White), East Side Entrance by Fountain	None Detected - Drywall Material None Detected - Texture / Joint Cmpd
04	Drywall System (Smooth Mop, Light Green), Hallway North by Room 15	None Detected - Drywall Material None Detected - Texture
05	Drywall System (Smooth Mop, Light Green), Hallway North, West Side	None Detected - Drywall Material None Detected - Texture
06	Drywall System (Smooth Mop, Light Green), Hallway North, East Wall	None Detected - Drywall Material None Detected - Texture
07	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 11 Nursery	None Detected - Drywall Material None Detected - Joint Compound None Detected - Texture
08	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 13, 3 - 4 Year Olds	None Detected - Drywall Material None Detected - Joint Compound None Detected - Texture
09	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 9, Community Room	None Detected - Drywall Material None Detected - Joint Compound None Detected - Texture
10	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 14, 5 Year / 1st Grade	None Detected - Drywall Material 2% Chrysotile - Old Texture None Detected - Joint Compound None Detected - New Texture
11	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 17, 3rd Grade	None Detected - Drywall Material 2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture None Detected - New Texture

PLM Summary Report

2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client : AEI Consultants
Project : 221 Oak Street, Abilene, TX 79602
Project # : 486170
Identification : Asbestos, Bulk Sample Analysis
Test Method : Polarized Light Microscopy / Dispersion Staining (PLM/DS)
EPA Method 600 / R-93 / 116

Lab Job No. : 23B-14001
Report Date : 11/28/2023
Sample Date :11/20/2023

On 11/20/2023, sixty seven (67) bulk material samples were submitted by Fadi Malakieh of AEI Consultants for asbestos analysis by PLM/DS. The PLM Detail Report is attached; additional information may be found therein. The results are summarized below:

Sample Number	Client Sample Description / Location	Asbestos Content
12	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 14, 5 years, 1st Grade	No Drywall Material None Detected - Joint Compound None Detected - Texture
13	Drywall / Joint Compound (Orange Peel, Dark Blue), Room 11, Nursery	None Detected - Drywall Material 2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture None Detected - New Texture
14	Drywall / Joint Compound (Heavy Mop, Blue), Room 10, Pastoral Staff	None Detected - Drywall Material 2% Chrysotile - Old Text / Joint Cmpd None Detected - New Texture
15	Drywall / Joint Compound (Heavy Mop, Blue), Room 10, Pastoral Staff	None Detected - Drywall Material None Detected - Joint Compound None Detected - Old Texture None Detected - New Texture
16	Drywall / Joint Compound (Heavy Mop, Blue), Room 10, Pastoral Staff	None Detected - Drywall Material None Detected - Old Text / Joint Cmpd None Detected - New Texture
17	Drywall System (Orange Peel, Red), Room 12, Red Room	None Detected - Drywall Material None Detected - Texture
18	Drywall System (Orange Peel, Red), Room 12, Red Room	None Detected - Drywall Material 2% Chrysotile - Old Texture None Detected - New Texture
19	Drywall System (Orange Peel, Red), Room 12, Red Room	None Detected - Drywall Material 2% Chrysotile - Texture / Joint Cmpd
20	Drywall / Joint Compound (Orange Peel, White), Room 15 Student Room	None Detected - Drywall Material 2% Chrysotile - Old Texture None Detected - Joint Compound None Detected - New Texture
21	Drywall / Joint Compound (Orange Peel, White), Room 15 Student Room	None Detected - Drywall Material 2% Chrysotile - Old Texture None Detected - Joint Compound None Detected - New Texture

PLM Summary Report

2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client :	AEI Consultants	Lab Job No. :	23B-14001
Project :	221 Oak Street, Abilene, TX 79602	Report Date :	11/28/2023
Project # :	486170	Sample Date :	11/20/2023
Identification :	Asbestos, Bulk Sample Analysis		
Test Method :	Polarized Light Microscopy / Dispersion Staining (PLM/DS) EPA Method 600 / R-93 / 116		

On 11/20/2023, sixty seven (67) bulk material samples were submitted by Fadi Malakieh of AEI Consultants for asbestos analysis by PLM/DS. The PLM Detail Report is attached; additional information may be found therein. The results are summarized below:

Sample Number	Client Sample Description / Location	Asbestos Content
22	Drywall / Joint Compound (Orange Peel, White), Room 15 Student Room	None Detected - Drywall Material 2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture None Detected - New Texture
23	Drywall / Joint Compound (Orange Peel, Orange Colored), Room 16	None Detected - Drywall Material 2% Chrysotile - Old Texture None Detected - Joint Compound None Detected - New Texture
24	Drywall / Joint Compound (Orange Peel, Orange Colored), Room 16	None Detected - Drywall Material 2% Chrysotile - Old Texture None Detected - Joint Compound None Detected - New Texture
25	Drywall / Joint Compound (Orange Peel, Orange Colored), Room 16	None Detected - Drywall Material 2% Chrysotile - Joint Compound 2% Chrysotile - Old Texture None Detected - New Texture
26	Carpet Mastic, Room 10, Pastoral Staff	None Detected - Yellow Mastic
27	Carpet Mastic, Room 12, Red Room	None Detected - Carpet Pad None Detected - Yellow Mastic
28	Carpet Mastic, Room 13, 3 - 4 Year Olds	None Detected - Carpet Pad None Detected - Yellow Mastic
29	12" x 12" Ceramic Tile (White), Entrance	None Detected - Ceramic Tile None Detected - Grout None Detected - Adhesive
30	12" x 12" Ceramic Tile (White), Hallway North	None Detected - Ceramic Tile No Grout No Adhesive
31	12" x 12" Ceramic Tile (White), Hallway North	None Detected - Ceramic Tile None Detected - Grout None Detected - Adhesive
32	2' x 4' Ceiling Tile (Pinholes White), Hallway North	None Detected - Acoustic Tile

PLM Summary Report

Moody Labs
2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client : AEI Consultants
Project : 221 Oak Street, Abilene, TX 79602
Project # : 486170
Identification : Asbestos, Bulk Sample Analysis
Test Method : Polarized Light Microscopy / Dispersion Staining (PLM/DS)
EPA Method 600 / R-93 / 116

Lab Job No. : 23B-14001
Report Date : 11/28/2023
Sample Date :11/20/2023

On 11/20/2023, sixty seven (67) bulk material samples were submitted by Fadi Malakieh of AEI Consultants for asbestos analysis by PLM/DS. The PLM Detail Report is attached; additional information may be found therein. The results are summarized below:

Sample Number	Client Sample Description / Location	Asbestos Content
33	2' x 4' Ceiling Tile (Pinholes White), Room 14	None Detected - Acoustic Tile
34	2' x 4' Ceiling Tile (Pinholes White), Room 10	None Detected - Acoustic Tile
35	4" Cove Base (Brown) with Mastic, Room 10, Pastoral Staff	None Detected - Cove Base None Detected - Cream Mastic
36	4" Cove Base (Brown) with Mastic, Room 10, Pastoral Staff	None Detected - Cove Base None Detected - Cream Mastic
37	4" Cove Base (Brown) with Mastic, Room 10, Pastoral Staff	None Detected - Cove Base None Detected - Cream Mastic
38	4" Cove Base (Black) with Mastic, Hallway North End	None Detected - Cove Base None Detected - Yellow Mastic
39	4" Cove Base (Black) with Mastic, Hallway North End	None Detected - Cove Base None Detected - Yellow Mastic
40	4" Cove Base (Black) with Mastic, Room 14	None Detected - Cove Base None Detected - Yellow Mastic
41	4" Cove Base (Red) with Mastic, Red Room, Room 12	None Detected - Cove Base None Detected - Cream Mastic
42	4" Cove Base (Red) with Mastic, Red Room, Room 12	None Detected - Cove Base None Detected - Cream Mastic
43	4" Cove Base (Red) with Mastic, Red Room, Room 12	None Detected - Cove Base None Detected - Cream Mastic
44	4" Cove Base (Silver) with Mastic, Room 17, 2nd - 3rd Grade	None Detected - Cove Base None Detected - Tan Mastic
45	4" Cove Base (Silver) with Mastic, Room 17, 2nd - 3rd Grade	None Detected - Cove Base None Detected - Tan Mastic
46	4" Cove Base (Silver) with Mastic, Room 17, 2nd - 3rd Grade	None Detected - Cove Base None Detected - Tan Mastic
47	12" x 12" Ceramic Tile (Dark Brown) with Grout, Men's Restroom	None Detected - Ceramic Tile None Detected - Grout

PLM Summary Report

2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client :	AEI Consultants	Lab Job No. :	23B-14001
Project :	221 Oak Street, Abilene, TX 79602	Report Date :	11/28/2023
Project # :	486170	Sample Date :	11/20/2023
Identification :	Asbestos, Bulk Sample Analysis		
Test Method :	Polarized Light Microscopy / Dispersion Staining (PLM/DS) EPA Method 600 / R-93 / 116		

On 11/20/2023, sixty seven (67) bulk material samples were submitted by Fadi Malakieh of AEI Consultants for asbestos analysis by PLM/DS. The PLM Detail Report is attached; additional information may be found therein. The results are summarized below:

Sample Number	Client Sample Description / Location	Asbestos Content
48	12" x 12" Ceramic Tile (Dark Brown) with Grout, Men's Restroom	None Detected - Ceramic Tile None Detected - Grout
49	12" x 12" Ceramic Tile (Dark Brown) with Grout, Women's Restroom	None Detected - Ceramic Tile None Detected - Grout
50	Exterior Brick (Red) with Mortar, Exterior Northeast	None Detected - Brick None Detected - Mortar
51	Exterior Brick (Red) with Mortar, Exterior Northeast	None Detected - Brick None Detected - Mortar
52	Exterior Brick (Red) with Mortar, Exterior Northwest	None Detected - Brick None Detected - Mortar
53	Exterior Stucco Ceiling (Beige), Exterior Northeast	None Detected - Stucco
54	Exterior Stucco Ceiling (Beige), Exterior Northeast	None Detected - Stucco
55	Exterior Stucco Ceiling (Beige), Exterior Northwest	None Detected - Stucco
56	Roof, Roof North Side End	None Detected - Roofing Tar None Detected - Roofing Felt None Detected - Drywall Material
57	Roof, Roof North Side Middle	None Detected - Roofing Tar None Detected - Roofing Felt None Detected - Drywall Material
58	Roof, Roof North Side by Entrance	None Detected - Roofing Tar None Detected - Roofing Felt None Detected - Drywall Material
59	Roof Flashing (Black), Roof HVAC West	5% Chrysotile - Flashing Tar
60	Roof Flashing (Black), Roof HVAC West	5% Chrysotile - Flashing Tar
61	Roof Flashing (Black), Roof HVAC East	5% Chrysotile - Flashing Tar
62	HVAC Mastic (White), Roof HVAC Unit West	None Detected - White Mastic
63	HVAC Mastic (White), Roof HVAC Unit West	None Detected - White Mastic

PLM Summary Report

2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client :	AEI Consultants	Lab Job No. :	23B-14001
Project :	221 Oak Street, Abilene, TX 79602	Report Date :	11/28/2023
Project # :	486170	Sample Date :	11/20/2023
Identification :	Asbestos, Bulk Sample Analysis		
Test Method :	Polarized Light Microscopy / Dispersion Staining (PLM/DS) EPA Method 600 / R-93 / 116		

On 11/20/2023, sixty seven (67) bulk material samples were submitted by Fadi Malakieh of AEI Consultants for asbestos analysis by PLM/DS. The PLM Detail Report is attached; additional information may be found therein. The results are summarized below:

Sample Number	Client Sample Description / Location	Asbestos Content
64	HVAC Mastic (White), Roof HVAC Unit East	None Detected - White Mastic
65	Laminate Flooring (Gray), Nursing Room, Room 11	None Detected - Sheet Flooring None Detected - Clear Mastic None Detected - Foam Backing
66	Laminate Flooring (Gray), Nursing Room, Room 11	None Detected - Sheet Flooring None Detected - Clear Mastic None Detected - Foam Backing
67	Laminate Flooring (Gray), Community Room, Room 9	None Detected - Sheet Flooring None Detected - Clear Mastic None Detected - Foam Backing

These samples were analyzed by layers. Quantification, unless otherwise noted, is performed by calibrated visual estimate. The test report shall not be reproduced except in full without written approval of the laboratory. The results relate only to the items tested. These test results do not imply endorsement by NVLAP or any agency of the U.S. Government. Accredited by the National Voluntary Laboratory Accreditation Program for Bulk Asbestos Fiber Analysis under Lab Code 102056-0.

NVLAP Testing NVLAP Lab Code 102056-0

Analyst(s): Amy Le, Jared Martin, Neil Kiphen

Lab Manager : Heather Lopez Approved Signatory : Heather Lopez

Lab Director : Bruce Crabb Approved Signatory : Bruce Crabb

Moody Labs
2051 Valley View Lane
Farmers Branch, TX 75234 Phone: (972) 241-8460

PLM Detail Report

Supplement to PLM Summary Report

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client : AEI Consultants
Project : 221 Oak Street, Abilene, TX 79602
Project # : 486170

Lab Job No. : 23B-14001
Report Date : 11/28/2023

Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
01	Drywall Material (Light Pink)	5%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	10%	Cellulose Fibers	100%		
	Glass DW Tape (White)	3%	Glass Wool Fibers	100%		
	Texture / Joint Cmpd (White)	82%	Calcite / Talc / Binders	100%		
02	No Drywall Material				11/27	NK
	DW Tape (White)	35%	Cellulose Fibers	100%		
	Joint Compound (White)	30%	Calcite / Talc / Binders	100%		
	Texture (White)	35%	Calcite / Talc / Binders	100%		
03	Drywall Material (Light Pink)	12%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	18%	Cellulose Fibers	100%		
	Texture / Joint Cmpd (White)	70%	Calcite / Talc / Binders	100%		
04	Drywall Material (Light Pink)	55%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	35%	Cellulose Fibers	100%		
	Texture (White)	10%	Calcite / Talc / Binders	100%		
05	Drywall Material (Light Pink)	60%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	30%	Cellulose Fibers	100%		
	Texture (White)	10%	Calcite / Talc / Binders	100%		
06	Drywall Material (Light Pink)	50%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	37%	Cellulose Fibers	100%		
	Texture (White)	13%	Calcite / Talc / Binders	100%		

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PLM Detail Report

Supplement to PLM Summary Report

NVLAP Lab Code 102056-0
TDSHS License No. 300084

Client : AEI Consultants
Project : 221 Oak Street, Abilene, TX 79602
Project # : 486170

Lab Job No. : 23B-14001
Report Date : 11/28/2023

Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
07	Drywall Material (Light Pink)	10%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	30%	Cellulose Fibers	100%		
	Joint Compound (White)	20%	Calcite / Talc / Binders	100%		
	Texture (White)	40%	Calcite / Talc / Binders	100%		
08	Drywall Material (Light Pink)	7%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	35%	Cellulose Fibers	100%		
	Joint Compound (White)	15%	Calcite / Talc / Binders	100%		
	Texture (White)	43%	Calcite / Talc / Binders	100%		
09	Drywall Material (Light Pink)	5%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	30%	Cellulose Fibers	100%		
	Joint Compound (White)	20%	Calcite / Talc / Binders	100%		
	Texture (White)	45%	Calcite / Talc / Binders	100%		
10	Drywall Material (Light Pink)	12%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	21%	Cellulose Fibers	100%		
	Old Texture (Off-White)	1%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Joint Compound (White)	30%	Calcite / Talc / Binders	100%		
	New Texture (White)	36%	Calcite / Talc / Binders	100%		

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11	Drywall Material (Light Pink)	3%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	32%	Cellulose Fibers	100%		
	Joint Compound (White)	18%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Old Texture (White)	35%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	New Texture (White)	12%	Calcite / Talc / Binders	100%		
12	No Drywall Material				11/27	NK
	DW Tape (White)	15%	Cellulose Fibers	100%		
	Joint Compound (White)	10%	Calcite / Talc / Binders	100%		
	Texture (White)	75%	Calcite / Talc / Binders	100%		
13	Drywall Material (Light Pink)	6%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	39%	Cellulose Fibers	100%		
	Joint Compound (White)	15%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Old Texture (White)	30%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	New Texture (White)	10%	Calcite / Talc / Binders	100%		
14	Drywall Material (Light Pink)	50%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	15%	Cellulose Fibers	100%		
	Old Text / Joint Cmpd (White)	25%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	New Texture (White)	10%	Calcite / Talc / Binders	100%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
15	Drywall Material (Light Pink)	<1%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	40%	Cellulose Fibers	100%		
	Glass DW Tape (White)	3%	Glass Wool Fibers	100%		
	Joint Compound (White)	12%	Calcite / Talc / Binders	100%		
	Old Texture (White)	20%	Calcite / Talc / Binders	100%		
	New Texture (White)	25%	Calcite / Talc / Binders	100%		
16	Drywall Material (Light Pink)	<1%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	12%	Cellulose Fibers	100%		
	Old Text / Joint Cmpd (White)	18%	Calcite / Talc / Binders	100%		
	New Texture (White)	70%	Calcite / Talc / Binders	100%		
17	Drywall Material (Light Pink)	67%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	18%	Cellulose Fibers	100%		
	Texture (White)	15%	Calcite / Talc / Binders	100%		
18	Drywall Material (Light Pink)	67%	Glass Wool Fibers	2%	11/27	NK
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	17%	Cellulose Fibers	100%		
	Old Texture (Off-White)	2%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	New Texture (White)	14%	Calcite / Talc / Binders	100%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
19	Drywall Material (White)	70%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper Facing (Tan)	10%	Cellulose Fibers	100%		
	Texture / Joint Cmpd (Off-White)	20%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
20	Drywall Material (Light Pink)	20%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Mica	<1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	18%	Cellulose Fibers	100%		
	Old Texture (Off-White)	2%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Joint Compound (White)	30%	Calcite / Talc / Binders	100%		
	New Texture (White)	30%	Calcite / Talc / Binders	100%		
21	Drywall Material (White)	10%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	25%	Cellulose Fibers	100%		
	Old Texture (Off-White)	2%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Joint Compound (White)	15%	Calcite / Talc / Binders	100%		
	New Texture (White)	48%	Calcite / Talc / Binders	100%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
22	Drywall Material (White)	20%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	20%	Cellulose Fibers	100%		
	Joint Compound (White)	25%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Old Texture (White)	20%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	New Texture (White)	15%	Calcite / Talc / Binders	100%		
23	Drywall Material (White)	5%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	20%	Cellulose Fibers	100%		
	Old Texture (Off-White)	5%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Joint Compound (White)	35%	Calcite / Talc / Binders	100%		
	New Texture (White)	35%	Calcite / Talc / Binders	100%		
24	Drywall Material (White)	10%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	20%	Cellulose Fibers	100%		
	Old Texture (Off-White)	5%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Joint Compound (White)	30%	Calcite / Talc / Binders	100%		
	New Texture (White)	35%	Calcite / Talc / Binders	100%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
25	Drywall Material (White)	10%	Glass Wool Fibers	2%	11/28	AL
			Cellulose Fibers	1%		
			Gypsum / Binders	97%		
	DW Paper / Tape (Tan / White)	15%	Cellulose Fibers	100%		
	Joint Compound (Off-White)	20%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	Old Texture (Off-White)	20%	Chrysotile	2%		
			Calcite / Talc / Binders	98%		
	New Texture (White)	35%	Calcite / Talc / Binders	100%		
26	Yellow Mastic (Yellow)	100%	Calcite	40%	11/28	AL
			Glue Binders	60%		
27	Carpet Pad (Dark Brown)	20%	Synthetic Foam	100%	11/28	AL
	Yellow Mastic (Yellow)	80%	Calcite	40%		
			Glue Binders	60%		
28	Carpet Pad (Dark Brown)	20%	Synthetic Foam	100%	11/28	AL
	Yellow Mastic (Yellow)	80%	Calcite	40%		
			Glue Binders	60%		
29	Ceramic Tile (White / Brown)	80%	Sintered Clays	100%	11/28	AL
	Grout (Grey)	<1%	Aggregate	65%		
			Cement Binders	35%		
	Adhesive (Cream)	20%	Calcite	50%		
			Glue Binders	50%		
30	Ceramic Tile (White / Brown)	100%	Sintered Clays	100%	11/28	AL
	No Grout					
	No Adhesive					
31	Ceramic Tile (White / Brown)	99%	Sintered Clays	100%	11/28	AL
	Grout (Grey)	<1%	Aggregate	65%		
			Cement Binders	35%		
	Adhesive (Cream)	1%	Calcite	50%		
			Glue Binders	50%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
32	Acoustic Tile (White)	100%	Cellulose Fibers	65%	11/28	AL
			Mineral Wool Fibers	15%		
			Perlite	20%		
33	Acoustic Tile (White)	100%	Cellulose Fibers	65%	11/28	AL
			Mineral Wool Fibers	15%		
			Perlite	20%		
34	Acoustic Tile (White)	100%	Cellulose Fibers	65%	11/28	AL
			Mineral Wool Fibers	15%		
			Perlite	20%		
35	Cove Base (Brown)	98%	Calcite / Vinyl Binders	100%	11/28	AL
	Cream Mastic (Cream)	2%	Calcite	50%		
			Glue Binders	50%		
36	Cove Base (Brown)	98%	Calcite / Vinyl Binders	100%	11/28	AL
	Cream Mastic (Cream)	2%	Calcite	50%		
			Glue Binders	50%		
37	Cove Base (Brown)	99%	Calcite / Vinyl Binders	100%	11/28	AL
	Cream Mastic (Cream)	1%	Calcite	50%		
			Glue Binders	50%		
38	Cove Base (Black)	60%	Calcite / Vinyl Binders	100%	11/28	AL
	Yellow Mastic (Yellow)	40%	Calcite	20%		
			Glue Binders	80%		
39	Cove Base (Black)	60%	Calcite / Vinyl Binders	100%	11/28	AL
	Yellow Mastic (Yellow)	40%	Calcite	20%		
			Glue Binders	80%		
40	Cove Base (Black)	60%	Calcite / Vinyl Binders	100%	11/28	AL
	Yellow Mastic (Yellow)	40%	Calcite	20%		
			Glue Binders	80%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
41	Cove Base (Red / Black)	98%	Calcite / Vinyl Binders	100%	11/28	AL
	Cream Mastic (Cream)	2%	Calcite	50%		
			Glue Binders	50%		
42	Cove Base (Red / Black)	98%	Calcite / Vinyl Binders	100%	11/28	AL
	Cream Mastic (Cream)	2%	Calcite	50%		
			Glue Binders	50%		
43	Cove Base (Red / Black)	100%	Calcite / Vinyl Binders	100%	11/28	AL
	Cream Mastic (Cream)	<1%	Calcite	50%		
			Glue Binders	50%		
44	Cove Base (Silver)	80%	Calcite / Vinyl Binders	100%	11/27	JM
	Tan Mastic (Tan)	20%	Calcite	40%		
			Glue Binders	60%		
45	Cove Base (Silver)	90%	Calcite / Vinyl Binders	100%	11/27	JM
	Tan Mastic (Tan)	10%	Calcite	40%		
			Glue Binders	60%		
46	Cove Base (Silver)	95%	Calcite / Vinyl Binders	100%	11/27	JM
	Tan Mastic (Tan)	5%	Calcite	40%		
			Glue Binders	60%		
47	Ceramic Tile (Dark Brown)	25%	Sintered Clays	100%	11/27	JM
	Grout (Brown)	75%	Aggregate	65%		
			Cement Binders	35%		
48	Ceramic Tile (Dark Brown)	55%	Sintered Clays	100%	11/27	JM
	Grout (Brown)	45%	Aggregate	65%		
			Cement Binders	35%		
49	Ceramic Tile (Dark Brown)	50%	Sintered Clays	100%	11/27	JM
	Grout (Brown)	50%	Aggregate	65%		
			Cement Binders	35%		

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Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
50	Brick (Gray)	98%	Sintered Clays	100%	11/27	JM
	Mortar (Red)	2%	Aggregate	65%		
			Cement Binders	35%		
51	Brick (Gray)	98%	Sintered Clays	100%	11/27	JM
	Mortar (Red)	2%	Aggregate	65%		
			Cement Binders	35%		
52	Brick (Gray)	98%	Sintered Clays	100%	11/27	JM
	Mortar (Red)	2%	Aggregate	65%		
			Cement Binders	35%		
53	Stucco (White)	100%	Aggregate	65%	11/27	JM
			Binders / Fillers	35%		
54	Stucco (White)	100%	Aggregate	65%	11/27	JM
			Binders / Fillers	35%		
55	Stucco (White)	100%	Aggregate	65%	11/27	JM
			Binders / Fillers	35%		
56	Roofing Tar (Black)	40%	Tar Binders	100%	11/27	JM
	Roofing Felt (Black)	40%	Glass Wool Fibers	45%		
			Tar Binders	55%		
	Drywall Material (Light Pink)	20%	Cellulose Fibers	2%		
			Gypsum / Binders	98%		
57	Roofing Tar (Black)	25%	Tar Binders	100%	11/27	JM
	Roofing Felt (Black)	25%	Glass Wool Fibers	45%		
			Tar Binders	55%		
	Drywall Material (Light Pink)	50%	Cellulose Fibers	2%		
			Gypsum / Binders	98%		

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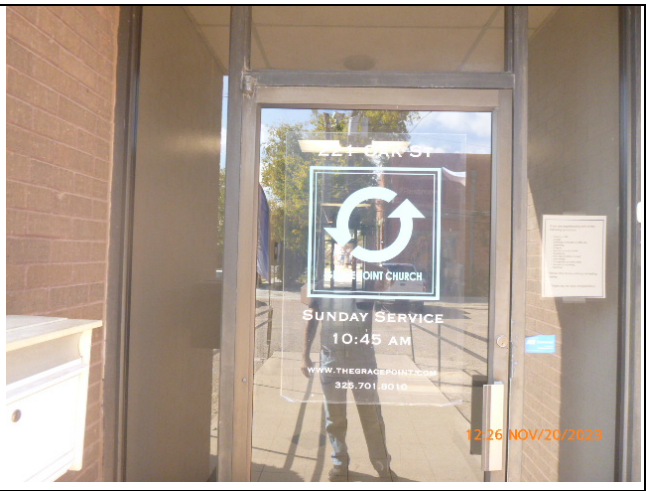
Sample Number	Layer	% Of Sample	Components	% of Layer	Analysis Date	Analyst
58	Roofing Tar (Black)	20%	Tar Binders	100%	11/27	JM
	Roofing Felt (Black)	20%	Glass Wool Fibers	45%		
			Tar Binders	55%		
	Drywall Material (Light Pink)	60%	Cellulose Fibers	2%		
			Gypsum / Binders	98%		
59	Flashing Tar (Black)	100%	Chrysotile	5%	11/27	JM
			Calcite	30%		
			Tar Binders	65%		
60	Flashing Tar (Black)	100%	Chrysotile	5%	11/27	JM
			Calcite	30%		
			Tar Binders	65%		
61	Flashing Tar (Black)	100%	Chrysotile	5%	11/27	JM
			Calcite	30%		
			Tar Binders	65%		
62	White Mastic (White)	100%	Calcite	50%	11/27	JM
			Binders / Fillers	50%		
63	White Mastic (White)	100%	Calcite	50%	11/27	JM
			Binders / Fillers	50%		
64	White Mastic (White)	100%	Calcite	50%	11/27	JM
			Binders / Fillers	50%		
65	Sheet Flooring (Gray)	63%	Calcite / Vinyl Binders	100%	11/27	JM
	Clear Mastic (Clear)	2%	Glue Binders	100%		
	Foam Backing (Black)	35%	Synthetic Foam	100%		
66	Sheet Flooring (Gray)	63%	Calcite / Vinyl Binders	100%	11/27	JM
	Clear Mastic (Clear)	2%	Glue Binders	100%		
	Foam Backing (Black)	35%	Synthetic Foam	100%		
67	Sheet Flooring (Gray)	58%	Calcite / Vinyl Binders	100%	11/27	JM
	Clear Mastic (Clear)	2%	Glue Binders	100%		
	Foam Backing (Black)	40%	Synthetic Foam	100%		

APPENDIX D

PHOTOGRAPHIC LOG

View of the Front of Church (Photograph 01)



View of the Front of the Entrance
(Photograph 02)

View of the Ceramic Floor Tiles and Walls in the Hallway (Photograph 03)

Close View to the Ceramic Floor Tile and the Cove Base (Black) (Photograph 04)

View of the 2'x4' Ceiling Tiles (Photograph 05)

View of the Ceramic Floor Tile (Brown)
(Photograph 06)

		
View of the Floor Ceramic Tile and the Drywall in the Hallway (Photograph 07)		**View of the ACM Dark Blue Walls (Photograph 08)**
		
View of the Laminate Flooring (Photograph 11)		View of the ACM Orange Walls (Photograph 10)
		
View of the ACM Heavy Mop Walls Sampling/Pastoral Staff (Photograph 11)		View of the Non-ACM HVAC Duct Insulation (Photograph 12)

	
View of the ACM White Walls at the Student Room (Photograph 13)	View of the Silver Cove Base (Photograph 14)
	
View of ACM Orange Walls at Room 16 (Photograph 15)	View of the Carpet Mastic (Photograph 16)
	
View of the Brown Cove Base (Photograph 17)	**View of the Exterior Stucco (Photograph 18)**

View of the Exterior Bricks (Photograph 19)

View of the Roof
(Photograph 20)

View of The HVAC Units on the Roof
(Photograph 21)

Close View of the HVAC Units (Photograph 22)

View of the ACM Roof Flashing Sampling (Photograph 23)

View of the Roof Core Sampling
(Photograph 24)

		
Another View of the Roof Core Sampling (Photograph 19)		View of the Roof Core Patching (Photograph 20)
		
View of the ACM Roof Flashing **(Photograph 21)**		**View of the ACM Roof Flashing Core Sample Patching** **(Photograph 22)**

SECTION 01 01 00
GENERAL SCOPE OF WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: The Project generally consists of, but is not necessarily limited to, the following:

Project consists of approximately 10,116 S.F. tenant finish-out to the existing building. The improvements consist of finishes upgrade to the existing classrooms, and the conversion of an existing classroom into restrooms for students. Building Exterior shall remain the same.

Project is located at:
221 Oak Street
Abilene, TX 79602

1. Site Work as noted in the Construction Documents.

B. Work Not Included, must meet Requirements:

1. Furnishings.

2. All Items Noted “N.I.C.” (Not In Contract) on Drawings.

1.02 CONTRACT DOCUMENTS

A. Requirements for all Work shall be executed in strict accordance with the following:

1. The Contract.

2. The Drawings.

3. The Approved Shop Drawings.

4. The General Conditions and Supplementary General Conditions.

5. The Specifications, Addenda and Bulletins.

6. The Change Orders and Directives received from the Owner and/or Architect.

7. Warranties and Guarantees in accordance with requirements of the Contract Documents, with period of Warranty as stated therein; except if Contractor neglects to correct or complete Work in Punch Lists during period of Warranty and/or Guaranty, Contractor is still responsible and required to do so after expiration dates of Warranty or Guaranty until the corrective Work is completed and accepted by the Owner.

8. The governing Building Code, all governing laws, ordinances, rules, permits, regulations and directives from governing authorities having jurisdiction over this Work.

9. The approved Construction Time and Sequence Schedule.

10. Cooperation with other Contractors employed on the Project by the Owner under separate contracts. Cooperation shall include, but not be limited to, written notices to others when required to implement proper coordination of the Work and to maintain the Construction Time and Sequence Schedule.

B. Intent of Contract Documents: Work not particularly detailed, marked, or specified shall be the same as similar parts that are detailed, marked, or specified. Should an error occur in the Specifications or Drawings, or in Work by others affecting this Work, the Contractor shall at once notify the Architect who will issue instructions as to procedure. If the Contractor proceeds with the Work based on such an error without instructions from the Owner, the Contractor shall make good any resulting damage or defects. This includes Specification typographical errors and Drawing notational errors where the intent is doubtful.

C. Conflicts: In the event of a conflict or need for interpretation between the Working Drawings and Specifications, the Architect shall be the sole interpreter of the Drawings and Specifications, to determine which, if any will take precedence.

D. Requirements of Regulatory Agencies: Furnish and install materials in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction over this Project, including “ICC/ANSI - A117.1 - Standard for Accessible and Usable Buildings and Facilities” and “Title III of The Americans with Disabilities Act (ADA), Public Law 101-336”.

1.03 QUALITY ASSURANCE

A. Standards: All exterior building materials and systems shall meet local building code requirements for fire spread, uplift resistance, and wind loads.

1.04 PROHIBITED SUSPENSION OF MATERIALS FROM METAL DECK

A. Suspension of any material or equipment from metal deck is strictly prohibited. Items not allowed to be attached to or suspended from the metal deck include but are not limited to

mechanical or electrical equipment, ducts, piping, light fixtures, or other decorative structures.

1.05 HAZARDOUS MATERIALS

A. The building shall be free of hazardous materials according to applicable federal, state, and local environmental regulations.

1.06 ASBESTOS FREE MATERIALS

A. No asbestos, or products containing asbestos, shall be installed in this Project. General Contractor shall provide to the Owner at completion of construction, an affidavit certifying that the Project is free of all asbestos - containing materials.

1.07 ACCESS TO SITE

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

1.08 WORK RESTRICTIONS

A. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor air intakes.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 15 00
CONTRACT STANDARDS AND PROCEDURES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: This section consists of establishing standards and procedures.

1.02 OPERATIONS

A. Layout: Locate and layout the Work, and establish lines and levels accurately. Report any discrepancies to the Architect immediately upon discovery.

B. Use of Premises: Confine apparatus, storage of materials, and operations of workmen to limits indicated by law, ordinance, permit, or arrangement with the Owner. Do not unreasonably encumber the premises with materials.

C. Project Meetings:

1. Progress Meetings: Schedule and conduct regular periodic progress meetings. All Key personnel of contractor and subcontractors shall attend. Notify other parties as the Owner’s Representative or Architect might designate, as job conditions and progress might warrant.

a. Contractor’s Construction Schedule: Review progress since last meeting, determine whether each activity is on time, ahead schedule, or behind schedule, in relation to the Contractor’s construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that correct and subsequent activities will be completed within Contract Time.

1) Review schedule for next scheduled progress meeting period.

b. Agenda: Review present and future needs of each entity present, including the following:

1) Interface requirement.

2) Sequence of operations.

3) Status of submittals.

4) Deliveries.

5) Off-site fabrication.

6) Access and site utilization.

7) Temporary facilities and controls.

8) Progress Cleaning

9) Quality and work standards

10) Status of correction of deficient items.

11) Field observations.

12) Status of RFIs.

13) Status of proposal requests.

14) Pending changes and Status of Change Orders.

15) Pending claims and disputes.

16) Documentation of information for payment requests.

c. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

2. Pre-construction Meeting: Schedule and conduct a preconstruction meeting before starting construction, at a time convenient to Owner and Architect, but no later than 10 days after execution of the Agreement. All Key personnel of owner, design professionals and contractors shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

a. Agenda: Discuss items of significance that could affect progress, including the following:

1) Tentative construction schedule.

2) Phasing and Staging.

3) Critical work sequencing and long-lead items.

4) Designation of key personnel and their duties.

5) Lines of communications.

6) Procedures for processing field decisions and Change Orders.

7) Procedures for RFIs.

8) Procedures for testing and inspecting.

9) Procedures for processing Application for Payment.

10) Distribution of the Contract Documents.

11) Submittal procedures.

12) Preparation of record documents.

13) Use of the premises.

14) Work restrictions.

15) Working hours.

16) Owner’s occupancy requirements.

17) Responsibility for temporary facilities and controls.

18) Procedures for moisture and mold control.

19) Procedures for disruptions and shutdowns.

20) Construction waste management and recycling.

21) Parking Availability.

22) Office, work, and storage areas.

23) Equipment deliveries and priorities.

24) First Aid.

25) Security.

26) Progress cleaning.

27) Safety.

b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

4. Pre-installation Meetings: Conduct a preinstallation meeting at Project site before each construction activity that requires coordination with other construction. All Key personnel of contractor, subcontractors, manufacturer representative and Owner's Commissioning Authority shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

a. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

1) Contract Documents.

2) Options.

3) Related RFIs.

4) Related Change Orders.

5) Purchases and Deliveries.

6) Submittals.

7) Review of Mockups.

8) Possible conflicts and Compatibility problems.

9) Time schedules and weather limitations.

10) Manufacturer's written recommendations.

11) Warranty requirements.

12) Compatibility of materials and acceptability of substrates.

13) Temporary facilities and controls.

14) Space and access limitations.

15) Regulations of authorities having jurisdiction.

16) Testing and inspecting requirements.

17) Installation procedures and coordination with other work.

18) Required performance results.

19) Protection of adjacent work, construction and personnel.

b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

5. Project Closeout Meetings: Schedule and conduct a Project closeout meeting, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion. All Key personnel of contractor, subcontractors, owner, owner's commissioning authority and design professionals shall attend. Notify other parties as the Owner's Representative or Architect might designate, as job conditions and progress might warrant.

a. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

1) Submission of record documents.

2) Procedures required prior to inspection for Substantial Completion and for Final inspections for acceptance.

3) Submittal of written warranties.

4) Requirements for preparing operations and maintenance data.

5) Requirements for demonstrations and training.

6) Preparation of Contractor's punch list.

7) Procedures for processing Applications for Payment at Substantial Completion and for final payment.

8) Submittal Procedures.

9) Coordination of separate contracts.

10) Owner's partial occupancy requirements.

11) Installation of Owner's furniture, fixtures, and equipment.

12) Responsibility for removing temporary facilities and controls.

b. Meeting Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

1.03 RECORDS

A. Record Drawings: Maintain on site a complete set of Construction Documents and Shop Drawings as required by Section 01 70 00 - Project Closeout.

B. Construction Photographs: Refer to Sections 01 32 33 - Photographic Documentation.

1.04 SUBMITTALS

A. Subcontractor List: Submit list of subcontractors with addresses, telephone numbers and e-mail addresses for approval within twenty-four (24) hours after notification of intent to enter into Contract. Prepare list on the form of a sworn statement attesting to the validity of such. Do not change the name of subcontractors or vendors on the approved list without the specific written form stating sufficient reason to warrant such a change.

B. Schedule of Values: Prepare detailed accounting of Contract Sum on the basis of "trades" Sections indicated in the Table of Contents. Submit and obtain approval before first application for payment. Use only approved breakdown for payment requests.

C. Payment Schedule: Submit to the Architect at least twenty (20) days prior to the submission of the first request for payment, a schedule detailing projected monthly requests for payment for the duration of the Project.

D. Shop Drawings and Samples:

1. Refer to Section 01 33 23 - Shop Drawings and Samples.

2. In addition to Section 01 33 23, the Contractor shall furnish the Owner with one (1) copy of all approved Shop Drawings and manufacturers product data bound in loose leaf form, for the Owner's records, prior to Owner issuing the Certificate of Substantial Completion.

E. Test Reports: Submit copies as required herein, with distribution as directed by the Architect.

1.05 DOCUMENTS

A. Performance and Labor and Material Payment Bonds:

1. If required, deliver to the Owner within ten (10) days of the date of the notification of intent to enter into Contract.

2. Condition bonds for the faithful performances of the Contract and for the payment of labor and material, each in the sum of 100% of the amount of the Contract as set forth in notification of intent to enter into Contract.

3. The Owner, at the Owner's discretion, reserves the right to accept or reject the company underwriting the bonds on the basis of their previous performance.

B. Agreement: Use AIA Form A111.

C. Application for Payment: Use AIA Form G702 and G703.

D. Sworn Statements: Use uniform commercial format designated by the Owner.

E. Insurance Certificate: Use form selected by Owner. Owner may, at the Owner's option, require a certified copy of Contractor's insurance policies in addition to insurance certificates.

1.06 QUALITY CONTROL

A. Standards: Establish a quality control system to perform sufficient inspection and tests of all Work, including subcontractors, to ensure conformance to applicable Specifications and Drawings, with respect to materials, workmanship, construction, finish, functional performance, and identification. Control system shall specifically include observation, supervision, and tests required in the Specifications.

B. Testing: Provide testing in accordance with Section 01 45 23 - Testing and Inspecting Services.

1.07 SCHEDULE

A. Dates: Work shall commence and be substantially completed as specified in the Contract Agreement.

B. Schedule:

1. Prepare a “Plan of Operations and Progress Schedule” to indicate the manner in which different phases of the Work are to be started, when Shop Drawings and submittals are to be submitted, colors selected, methods and speed for progressing different phase actions, and dates upon which subcontractors are dependent upon other sub-contracts. Schedule shall indicate major items of Work, including foundations, column footings, steel erection, floor finishes, underfloor plumbing and electrical Work, roof mounted HVAC equipment, concrete floor pours, partition Work, and date of Final Completion.

2. Plan of Operations and Progress Schedule shall be “weighted” to schedule each trade in proportion to the entire Project, physically and financially.

3. Revise schedule monthly to indicate actual progress compared to the estimated progress.

4. Post schedule in the Contractor’s field office and distribute copies to the Owner, Architect, Project Representative, and all prime Subcontractors.

1.09 PAYMENT

A. Requests:

1. On or before the tenth (10th) day of each month, the Contractor shall make application for payment in quadruplicate based on percentage of completion of items of cost breakdown.

2. Each application after the first one shall be accompanied by waivers of lien and sworn statements that all labor, materials, and services included in the previous and prior statements have been paid, less only the retained percentage stated herein, and any disputed amounts which shall be stated. In addition, the Contractor shall request and file with the request for payment a sworn statement from each Subcontractor that the Contractor has direct contractual relations with.

B. Payment: The Owner shall make payments on account of each contract as provided herein. Within thirty (30) days after submission and approval of the application for payment the Owner will pay ninety (90) percent of the value except as may be modified as follows, based on the Contract prices, including executed change orders amending the Contract, on labor and materials incorporated in the Work, and material suitably stored at the site up to the first day of that month as certified by the Architect, less the aggregate of the previous payments.

C. Retained Percentage:

1. Five (5%) percent of the estimated amounts shall be retained until the final completion and acceptance of all Work covered by the Contract.

2. The retained percentage shall be paid thirty-five (35) days after Owner's acceptance of the building, providing that all requirements of the Contract are met. Refer to Closing Procedure.

D. Substantial Completion Payment: Upon issuance of Certificate of Substantial Completion, a sum shall be paid sufficient to increase the payments to the total of the Contract, less the retained percentage.

E. Final Certificate:

1. After the Contractor has complied with the closing requirements specified herein, and provided the Architect with appropriate documentation, the Architect shall certify such, issuing a Final Certificate.

2. Issuance of such Certificate does not relieve the Contractor of the responsibilities related to guaranteeing the performance of the facility, as specified herein or otherwise provided.

1.10 CLEANING

A. Keep the premises free from accumulation of waste materials or rubbish caused by Work operations at all times. At the completion of the Work remove all waste materials and rubbish from and about the Project, as well as all tools, construction equipment, machinery, and surplus materials.

B. Establish and enforce a daily system for collecting and disposing waste materials from construction areas and elsewhere at Project site. Do not hold collected materials at site for more than three (3) days. Handle hazardous, dangerous, unsanitary, contaminating, pollution and similar harmful wastes separately from inert materials by containerizing in an appropriate manner. Dispose of each category of waste material in a lawful manner. Do not bury or burn waste materials on Owner's property.

1.10 CLOSING PROCEDURES

A. Financial:

1. Furnish ample evidence to Architect and Owner that all financial obligations have been met, including sworn statements and final waivers of lien.
2. Obtain a written statement releasing the Owner and the Architect from any and all

obligations which might arise out of any unpaid, defaulted, or otherwise unsatisfied accounts.

B. Punch List:

1. Complete and correct all items on the Punch List as originally issued, and amended.
2. If contemplating application for final payment, schedule a joint inspection visit to the Project with the Architect one (1) week in advance to determine if the Contracts have been fully executed.

C. Record Drawings: Deliver not less than three (3) sets of documents to the office of the Architect.

D. Warranties and Guarantees:

1. Submit all written warranties and guarantees.
2. Submit as applicable, list of contacts, including company name, personal contact, address, telephone number, and e-mail address for building equipment and components which may require periodic service, including roofing, power actuated doors, mechanical equipment, fire protection, plumbing, and electrical equipment.

C. Other Documents:

1. Furnish reports of all tests and the performance of completed systems, as required in the Specifications, and all certificates of approval.
2. Furnish all schedules, instructions, and equipment operation and service manuals as necessary to ensure safe and proper operation and maintenance of products installed in the building.

E. Final Certificate: Issuance of Final Certificate does not relieve the Contractors of the responsibilities related to warranting and guarantying the performance of the Work.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Quantity allowances.
3. Contingency allowances.
4. Testing and inspecting allowances.

C. Related Requirements:
1. Section 01 40 00 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

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

B. At 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 Architect from the designated supplier.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

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

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight**,** and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner and/or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

D. All Allowances remaining balance at the end of the project shall be returned/credited back to the Owner.

E. The allowance shall appear on the schedule of value as a line item.

1.8 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

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

Allowance No. 1: Lump-Sum Allowance: General Contractor to include Owners Contingency Allowance in the amount of $20,000.00 (Twenty Thousand U.S. Dollars).

Allowance No. 2: Lump-Sum Allowance: General Contractor to include Architect Design Contingency-Betterment Allowance in the amount of $15,000.00 (Fifteen Thousand U.S. Dollars).

END OF SECTION

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. Section 01 60 00 "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 and proposed by Contractor.

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 in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

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

1. Substitution Request Form: Use Industry Standard Form

2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination 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 substitution 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 and 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, NFPA, end related codes adopted by the City of **Mercedes, Texas**.

j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating 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 through Construction Manager 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.

PART 2 - PRODUCTS

2.1 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: Architect will consider requests for substitution if received within 30 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

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

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.

g. Requested substitution is compatible with other portions of the Work.

h. Requested substitution has been coordinated with other portions of the Work.

i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
5. Subschedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide subschedules showing values coordinated with the scope of each design services contract as described in Section 01 01 00 "General Scope of Work."

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

1. Identification: Include the following Project identification on the schedule of values:

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

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

5. Round amounts to nearest whole dollar; 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.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Application for Payment Forms: Use AIA Document G702 as form for Applications for Payment.

D. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or proceeded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

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

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Submittal schedule (preliminary if not final).
5. List of Contractor's staff assignments.
6. List of Contractor's principal consultants.
7. Copies of building permits.
8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
9. Initial progress report.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.

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

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.

B. Field engineering.

C. Pre-construction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Pre-installation meetings.

G. Equipment electrical characteristics and components.

H. Cutting and patching.

I. Special procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical work, which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's occupancy.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of project and acceptable to Architect/Engineer.

B. Contractor shall locate and protect survey control and reference points. Promptly notify Architect/Engineer of any discrepancies discovered.

C. Control datum for survey is that established by Owner provided survey.

D. Verify set-backs and easements; confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

F. Submit a copy of site drawing and certificate signed by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

G. Maintain a complete and accurate log of control and survey work as it progresses.

H. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

I. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

J. Promptly report to Architect/Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

1.4 PRECONSTRUCTION MEETING

A. Owner and Architect/Engineer will schedule a meeting after Notice of Award.

B. Attendance Required: Owner, Architect/Engineer, and Contractor.

C. Agenda:

1. Execution of Owner-Contractor Agreement.

2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.

4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.

5. Designation of personnel representing the parties in Contract, Owner and the Architect/Engineer.

6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

7. Scheduling.

8. Scheduling activities of a Geotechnical Engineer.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.5 SITE MOBILIZATION MEETING

A. Architect/Engineer and Owner will schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required: Owner, Architect/Engineer, Special Consultants, Contractor, Contractor's Superintendent, and major Subcontractors.

C. Agenda:

1. Use of premises by Owner and Contractor.

2. Owner's requirements.

3. Construction facilities and controls provided by Owner.

4. Temporary utilities provided by Owner.

5. Survey and building layout.

6. Security and housekeeping procedures.

7. Schedules.

8. Application for payment procedures.

9. Procedures for testing.

10. Procedures for maintaining record documents.

11. Requirements for start-up of equipment.

12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distributes copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.

B. Contractor shall coordinate with Architect/Engineer arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major subcontractors and suppliers, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.

2. Review of work progress.

3. Field observations, problems, and decisions.

4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

E. Record minutes and distributes copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

1.7 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, Work of the specific section.

C. Notify Architect/Engineer seven days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of installation, preparation and installation procedures.

2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, participants, and those affected by decisions made.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Motors: Specific motor type is specified in individual specification sections.

B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

C. Cord and Plug: Provide minimum 6 foot cord and plug including grounding connector for connection to electric wiring system. Cord of longer length is specified in individual specification sections.

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Submit written request in advance of cutting or altering elements which affect:

1. Structural integrity of element.

2. Integrity of weather-exposed or moisture-resistant elements.

3. Efficiency, maintenance, or safety of element.

4. Visual qualities of sight exposed elements.

5. Work of Owner or separate contractor.

C. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.

2. Uncover Work to install or correct ill-timed Work.

3. Remove and replace defective and non-conforming Work.

4. Remove samples of installed Work for testing.

5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

D. Execute work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

E. Cut masonry and concrete materials using masonry saw or core drill.

F. Restore Work with new products in accordance with requirements of Contract Documents.

G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with applicable codes, to full thickness of the penetrated element.

J. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

K. Identify hazardous substances or conditions exposed during the Work to the Architect/Engineer for decision or remedy.

3.2 SPECIAL PROCEDURES

A. Materials: As specified in product sections; match existing with new products and salvaged products for patching and extending work.

B. Employ skilled and experienced installer to perform alteration work.

C. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

D. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

E. Remove debris and abandoned items from area and from concealed spaces.

F. Prepare surface and remove surface finishes to provide for proper installation of new work and finishes.

G. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

H. Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring products and finishes to specified condition.

I. Refinish existing visible surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

J. Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

K. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Architect/Engineer for review.

L. Where a change of plane of ¼ inch or more occurs, submit recommendation for providing a smooth transition to Architect/Engineer for review.

M. Trim existing doors as necessary to clear new floor finish. Refinish trim as required.

N. Patch or replace portions of existing surfaces, which are damaged, lifted, discolored, or showing other imperfections.

O. Finish surfaces as specified in individual product sections.

END OF SECTION

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1. General coordination procedures.

2. Coordination drawings.

3. Requests for Information (RFIs).

4. Project Web site.

5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 01 15 00 "Contract Standards and Procedures" for preparing and submitting Contractor's construction schedule.

2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

3. Section 01 70 00 "Project Closeout" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.

3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 10 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if 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 to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.

2. Preparation of the schedule of values.

3. Installation and removal of temporary facilities and controls.

4. Delivery and processing of submittals.

5. Progress meetings.

6. Preinstallation conferences.

7. Project closeout activities.

8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. 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 the coordination drawings by multiple contractors 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 the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. 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 subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures 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.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.

    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.

    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes dimensioned from column center lines.

8. Fire-Protection System: Show the following:

    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.

9. Review: Architect will review coordination drawings to confirm that 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 changes as directed and resubmit.

10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 01 33 00 "Submittal Procedures."

1.7 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

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

1. Project name.

2. Project number.

3. Date.

4. Name of Contractor.

5. Name of Architect and Construction Manager.

6. RFI number, numbered sequentially.

7. RFI subject.

8. Specification Section number and title and related paragraphs, as appropriate.

9. Drawing number and detail references, as appropriate.

10. Field dimensions and conditions, as appropriate.

11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

12. Contractor's signature.

13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.

    b. Requests for approval of substitutions.

    c. Requests for approval of Contractor's means and methods.

    d. Requests for coordination information already indicated in the Contract Documents.

    e. Requests for adjustments in the Contract Time or the Contract Sum.

    f. Requests for interpretation of Architect's actions on submittals.

    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.

3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

D. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly Include the following:

1. Project name.

2. Name and address of Contractor.

3. Name and address of Architect and Construction Manager.

4. RFI number including RFIs that were returned without action or withdrawn.

5. RFI description.

6. Date the RFI was submitted.

7. Date Architect's and Construction Manager's response was received.

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

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT WEB SITE

A. Use Architect's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion when file size surpasses e-mail max attachment limit, and when otherwise directed by Architect.

B. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the specifications.

PART 1 - GENERAL

1.01 SCOPE

A. This Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.

2. Periodic construction photographs.

3. Final Completion construction photographs.

1.02 SUBMITTALS

A. Construction Photographs: Submit digital photographs 14 days of taking photographs and digital copies with the monthly application for payment.

1. Format: 3x5 inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.

2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:

a. Name of Project.

b. Name and address of photographer.

c. Name of Architect.

d. Name of Contractor.

e. Date photograph was taken if not date stamped by camera.

f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

g. Unique sequential identifier.

3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

PART 2 - PRODUCTS

2.01 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 pixels.

PART 3 - EXECUTION

3.01 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.

2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Architect.

C. Pre-construction Photographs: Before commencement of construction the contractor shall document in digital photographs the project site and surrounding properties, including existing items to remain during construction, from different vantage points.
1. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Periodic Construction Photographs: Take color, digital photographs monthly, coinciding with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

E. Final Completion Construction Photographs: Take ten color photographs after date of Substantial Completion for submission as Project Record Documents. Architect will direct photographer for desired vantage points.

1. Do not include date stamp.

F. Additional Photographs: Architect may issue requests for additional photographs, in addition to periodic photographs specified.

1. Three days' notice will be given, where feasible.

2. In emergency situations, take additional photographs within 24 hours of request.

3. Circumstances that could require additional photographs include, but are not limited to, the following:

a. Special events planned at Project site.

b. Immediate follow-up when on-site events result in construction damage or losses.

c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.

d. Substantial Completion of a major phase or component of the Work.

e. Extra record photographs at time of final acceptance.

f. Owner's request for special publicity photographs.

END OF SECTION

SECTION 01 33 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

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

B. Related Requirements:

1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

    a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
    b. Digital Drawing Software Program: The Contract Drawings are available in PDF drawings.
    c. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    d. Digital data drawing files will be made available in PDF Format.

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
5. Insert list of submittals requiring sequential review in first subparagraph below, or delete and identify submittals in Sections where they are specified. Structural, HVAC, plumbing, and electrical components are examples of the Work that often require sequential review.
6. Allowing procedure in "Concurrent Consultant Review" Subparagraph below may cause tracking problems for Architect and Construction Manager, if any. Delete if not allowed. See Evaluations.
7. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.

b. Date.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.

1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

a. Transmittal Form for Paper Submittals: Use AIA Document G810.
b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

1) Project name.
2) Date.
3) Destination (To:).
4) Source (From:).
5) Name and address of Architect.
6) Name of Construction Manager.
7) Name of Contractor.
8) Name of firm or entity that prepared submittal.
9) Names of subcontractor, manufacturer, and supplier.
10) Category and type of submittal.
11) Submittal purpose and description.
12) Specification Section number and title.
13) Specification paragraph number or drawing designation and generic name for each of multiple items.
14) Drawing number and detail references, as appropriate.

15) Indication of full or partial submittal.
16) Transmittal number, numbered consecutively.
17) Submittal and transmittal distribution record.
18) Remarks.
19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.
    o. Indication of full or partial submittal.
    p. Transmittal number, numbered consecutively.
    q. Submittal and transmittal distribution record.
    r. Other necessary identification.
    s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

    a. Project name.

b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Architect's FTP site specifically established for Project.

a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.

a. Architect, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Action Submittals: Submit submittals in PDF Format or three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
4. Informational Submittals: Submit in PDF Format or submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

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

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

    a. PDF electronic file.
    b. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:

    a. PDF electronic file.
    b. Two opaque (bond) copies of each submittal. Architect, will return one copy(ies).
    c. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

    a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format:

   a. PDF electronic file.
   b. Three paper copies of product schedule or list unless otherwise indicated. Architect will return two copies.

F. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017000 "Project Closeout."

K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

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

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

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

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

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

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.

5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

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

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

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

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

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

3.2 ARCHITECT'S ACTION

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

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

SECTION 01 33 23
SHOP DRAWINGS AND SAMPLES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SUBMITTALS

A. Summary Listing and Schedule: General Contractor shall prepare a summary listing and schedule for submission of Shop Drawings, Samples, and Product Data to the Architect for review of the various items of Work. Schedule shall allow approximately two (2) calendar weeks or ten (10) working days for review; however, this may vary depending upon the quantity of the material submitted. Schedule shall also allow time for submission of Shop Drawings, Samples, and Brochures which may not be approved.

B. Substitution Requests: Submit three copies of each request for consideration. Indentify product or fabrication or installation method to be replaced. Include specification section number and title and drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination 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 signification qualities of proposed substitution 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 requirement included. Indicate deviations, if any, from the work specified.

d. Product Data, including drawings and descriptions of product and fabrications and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

h. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the work, including effect on overall contract time. If specified product or method of construction cannot be provided within contract time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

i. Cost information, including a proposal of change, if any, in contract sum.

j. Contractor's certification except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

k. 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.

2. 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 through General 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.

c. Conditions of Acceptance: 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:

(1) 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.

(2) Requested substitution does not require extensive revisions to the contract documents.

(3) Requested substitution is consistent with the contract documents and will produce indicated results.

(4) Substitution request is fully documented and properly submitted.

(5) Requested substitution will not adversely affect Contractor's construction schedule.

(6) Requested Substitution has received necessary approvals of authorities having jurisdiction.

(7) Requested Substitution is compatible and has been coordinated with other portions of the work.

(8) Requested Substitution provides specified warranty.

(9) If requested Substitution involves more than one contractor, requested substitution has been coordinated with other products, and is acceptable to all contractors involved.

C. Submittals: Each Subcontractor shall submit through the General Contractor, to the Architect at proper times, all Shop Drawings, Product Data, and setting diagrams which the Architect may deem necessary to illustrate the Work intended or show its relation to Work of other trades. Shop Drawings and Product Data shall contain manufacturer's name, material description, sizes and dimensions, and other pertinent information. All submittals, including resubmittals, shall have Product Data identifying the materials to be supplied by circling or denoting the intended materials on the Product Data sheets.

1. Prohibited Submittals: Contractors shall not duplicate Design/Working Drawings for use as Shop Drawings. Duplicated Drawings of this nature shall be rejected.

2. Required Information: Include in submittals sufficient drawings, plans, elevations, sections, performance data, dimensions, bolt locations, inserts, sound data, weights and schematics to clearly describe the equipment and to show compliance with the Specifications. Provide a cover or title sheet for each submittal containing the following:

a. Name of Contractor originating the submittal.

b. Name of Project for which the submittal is made.

c. An index of all items submitted.

d. Identification of each item of material and equipment.

e. Date of submittal.

f. Contractor's certification.

D. Deviations: Any and all deviations from the Specifications and/or Drawings must be brought to the Architect's attention by circling all items submitted for review.

E. Identification: Shop Drawing submittals and transmittal letters shall be identified with title and location of Project, names of the Architect, the Contractor, and the submission date.

F. Compliance Review: All Shop Drawings and Product Data submitted to the Architect shall be stamped by the General Contractor to indicate that the submittal has been reviewed for compliance with the Contract Documents, coordination between other Trade Work, and related details.

G. Reimbursement of Architect's Costs:

1. In the event substitutions are proposed to the Architect after the Contract has been awarded, the Architect will record all time used by the Architect and the Architect's consultants in evaluation of each proposed substitution.

2. Whether or not the Architect approves a proposed substitution, the Contractor shall promptly upon receipt of the Architect's billing, reimburse the Architect at the rate of two and three-quarter (2-3/4) times the direct cost of the Architect and the Architect's consultants for all time spent in evaluating the proposed substitution.

H. Architectural and Structural Shop Drawings: The General Contractor shall submit to the Architect, for review, one (1) reproducible and three (3) prints of each Drawing.

1. If the Shop Drawings are returned "Revise & Resubmit", the effected Contractor shall correct the original Drawings and resubmit the Shop Drawings as originally required, i.e., one (1) reproducible and three (3) prints, to the Architect for review, file, and distribution.

2. Submit six (6) copies of Product Data such as catalog cuts and brochures.

I. Mechanical and Electrical Shop Drawings: Submit for review six (6) copies of all equipment and products in a brochure type format.

J. Required Shop Drawings: Shop Drawings are required for, but are not necessarily limited to the items as required by the Drawings and/or Specifications within the Project Manual.

K. Review of Shop Drawings:

1. It shall be distinctly understood that the review of Shop Drawings shall be for General Scheme only. Review does not relieve the Contractor from the necessity of correcting, without charge, details on the Drawings and completed Work found deficient in strength or otherwise faulty.

2. The Architect assumes no responsibility for “figured dimensions” of Shop Drawings.

3. The review of Shop Drawings does not relieve or modify the responsibility for compliance with the Contract Documents or dimensions or errors contained in the submittal or quantity count. It is clearly understood that in the review process, noting of some discrepancies, but overlooking others, does not grant the Contractor permission to proceed in error. Regardless of any information contained in the Shop Drawings, layout drawings, catalog data and brochures, the Contract Documents govern the Work, and are neither waived nor suspended in any way by the review of Shop Drawings, layout drawings, catalog data and brochures.

4. Upon completion of the Project the Owner shall be given one (1) set of reviewed Shop Drawings.

L. Authorization: Unless specifically otherwise required by the Architect and the Owner, no materials shall be ordered, delivered, fabricated, or erected until the proper written review by the Architect has been received by the General Contractor.

1.02 SAMPLES AND LETTERS OF INTENT

A. Summary Listing: General Contractor shall prepare a summary listing of the Samples and Letters of Intent submittal requirements for review by the Architect and the Owner’s Supervising Engineer.

B. Material Samples and Letters of Intent: Samples and Letters of Intent as listed and requested in the respective trade Specifications enumerate, but do not necessarily limit, the material Samples or Letters of Intent indicating materials, specifications, and/or installation procedures, which shall be submitted for approval PRIOR to purchase or installation of materials. All material Samples shall be reviewed by the Architect, and/or Owner PRIOR to erection or fabrication.

C. Samples: Submit to Architect for review, four (4) actual Samples of all materials to be used in the Work. All Samples shall have the same finish as that to be used in the completed Work. Manufacturer's color charts and/or color swatches shall not be acceptable as Samples. Samples shall be accompanied by a letter requesting approval and presenting all required data.

D. Materials: All materials furnished shall be fully equal to the reviewed Samples.

E. Selections: Where the choice of more than one make or style of article or material is specified, the final selection of the article or material shall be made by the Owner.

F. Quality, Fitness, and Workmanship: The quality or fitness of materials or workmanship shall be based on the requirements that all Work done or materials furnished shall be first class in every respect, and what is usual or customary on other projects shall in no way enter into any consideration or decision.

G. Differences in Price: Where any difference occurs in price of such articles or materials, such differences are to be given before the Contracts are signed. After the Contracts have been signed, the Owner reserves the right to choose whichever article or material the Owner desires, assuming, unless previously advised to the contrary, the price is not changed thereby. Where the Specifications require a specific item "equal or comparable products" or other words to that effect, the final selection will be by the Owner.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances

C. References.

D. Mock-up requirements.

E. Testing and inspection services.

F. Manufacturers' field services.

G. Examination.

H. Preparation.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 REFERENCES

A. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from the Architect/Engineer before proceeding.

E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect/Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so by Architect/Engineer.

1.6 TESTING AND INSPECTION SERVICES

A. Owner will employ services of an independent firm to perform testing and inspection. Contractor shall pay for services.

B. The independent firm will perform tests, inspections and other services specified in individual specification sections and as required by the Architect/Engineer and Owner, or Authority having jurisdiction.

1. Laboratory: Authorized to operate in location in which Project is located.

2. Laboratory Staff: Maintain a full time specialist on staff to review services.

3. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

C. Testing, inspections and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Architect/Engineer and Contractor, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.

1. Notify Architect/Engineer and independent firm 24 hours prior to expected time for operations requiring services.

2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

G. Re-testing or re-inspection required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for re-testing or re-inspection will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.

H. Agency Responsibilities:

1. Test samples of mixes submitted by Contractor.

2. Provide qualified personnel at site. Cooperate with Architect/Engineer and Contractor in performance of services.

3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Architect/Engineer and Contractor of observed irregularities or non-conformance of Work or products.

6. Perform additional tests required by Architect/Engineer.

7. Attend preconstruction meetings and progress meetings.

I. Agency Reports: After each test, promptly submit four copies of report to Architect/Engineer and to Contractor. When requested by Architect/Engineer, provide interpretation of test results. Include the following:

1. Date issued.

2. Project title and number.

3. Name of inspector.

4. Date and time of sampling or inspection.

5. Identification of product and specifications section.

6. Location in the Project.

7. Type of inspection or test.

8. Date of test.

9. Results of tests.

10. Conformance with Contract Documents.

J. Limits On Testing Authority:

1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency or laboratory may not approve or accept any portion of the Work.

3. Agency or laboratory may not assume any duties of Contractor.

4. Agency or laboratory has no authority to stop the Work.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect/Engineer 30 days in advance of required observations. Observer subject to approval of Architect/Engineer and Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01 33 0 - SUBMITTAL PROCEDURES, MANUFACTURERS' FIELD REPORTS article.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 45 23
TESTING AND INSPECTING SERVICES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included:

1. Owner will obtain the services of an Independent Testing Laboratory to perform testing services for concrete, steel and other materials as required, specified or directed. The Testing Laboratory shall evaluate and approve all soils testing performed by the Project Soils Engineer.

2. Requirements for testing are described in various sections of the Specifications. Where no testing requirements are described, but the Owner determines that testing is required, the Owner may require testing to be performed under currently recognized standards for testing.

B. Related Work:

1. Selection of Testing Laboratory: The Owner will select and approve a qualified, unbiased, and recognized independent commercial testing agency.

1.02 CODES AND STANDARDS

A. Testing, when required, shall be in accordance with all pertinent codes and regulations, and with selected ASTM International Standard Specifications.

1.03 TEST REPORTS AND RELATED INSTRUCTIONS

A. Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay to progress of the Work.

1.04 PAYMENT FOR TESTING SERVICES

A. Initial Services: Triumph Public High Schools is to pay for all Owner Selected initial testing services.

B. Retesting: When the initial tests indicate non-compliance with Contract Documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same agency, and the costs thereof will be paid by the General Contractor.

1.05 CODE COMPLIANCE TESTING

A. Responsibility of Inspection and Testing: Inspection and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities or a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.06 TESTING LABORATORY DUTIES

A. Cooperation: Cooperate with Architect/Engineer and Contractor; provide qualified personnel after due notice.

B. Perform Specified Inspections, Sampling and Testing of Materials and Methods of Construction:

1. Take all specimens and samples.

2. Provide all sampling equipment and personnel.

3. Make all deliveries of specimens and samples to the Testing Laboratory.

4. Comply with specified standards.

5. Ascertain compliance of materials, and Work, with requirements of Contract Documents.

C. Irregularities and Deficiencies: Immediately notify Architect/Engineer, Owner's Supervising Engineer, and Contractor of observed irregularities or deficiencies of Work or products in the field or laboratory as a result of testing. All irregularities and deficiencies encountered shall not go unresolved. Testing reports submitted to Architect/Engineer shall be for file purposes only and shall include the resolution of these irregularities and/or deficiencies.

D. Reports of Tests and Inspections: Promptly submit written report of each test and inspection; one (1) copy each to Owner's Supervising Engineer, Owner, and Contractor, and three (3) copies to Architect/Engineer. Each report shall include:

1. Date issued.

2. Detailed listing.

3. Project title and number.

4. Testing Laboratory name, address and telephone number.

5. Name and signature of laboratory inspector.

6. Date and time of sampling or inspection.

7. Record of temperature and weather conditions.

8. Date of test.

9. Identification of product and Specification section.

10. Location of sample or test in the Project.

11. Name of person taking sample or making test.

12. Type of inspection or test.

13. Results of tests and compliance with Contract Documents.

14. Interpretation of test results, when requested by Architect/Engineer.

E. Additional Tests: Perform additional tests as required by Architect/Engineer, Owner's Supervising Engineer, or Owner.

F. Special Inspections: Submit “Statement of Special Inspections” and a certified written report of each special inspection, test or similar service; one (1) copy each to Owner's Supervising Engineer, Owner, and Contractor, and three (3) copies to Architect/Engineer. Submit additional copies of each report to governing authority, when the authority so directs.

1. Report Data: Written inspection or test reports for the Project shall include, but shall not necessarily be limited to applicable special inspections listed below:

a. Inspection of Fabrication per Building Code Section 1704.2, and as required by Structural Drawings.

b. Inspection of Steel Construction per Building Code Section 1704.3, and as required by Structural Drawings.

c. Inspection of Concrete Construction per Building Code Section 1704.4, and as required by Structural Drawings.

d. Inspection of Masonry Construction per Building Code Section 1704.5, and as required by Structural Drawings.

e. Inspection of Soils per Building Code Section 1704.7, and as required by Structural Drawings.

f. Inspection of Pier Foundations per Building Code Section 1704.9, and as required by Structural Drawings.

g. Inspection of Wall Panels and Veneers (seismic) per Building Code Section 1704.10, and as required by Structural Drawings.

h. Inspection of Exterior Insulation and Finish Systems (EIFS) per Building Code Section 1704.12.

1.07 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents.

2. Approve or accept any portion of the Work.

3. Perform any duties of the Contractor.

1.08 CONTRACTOR'S RESPONSIBILITIES

A. General: Cooperate with laboratory personnel, provide access to Work, to material manufacturer’s operations.

B. Samples: Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Preliminary Design Mixes: Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the Testing Laboratory.

D. Test Reports: Furnish copies of Products test reports as required.

E. Furnish Incidental Labor and Facilities:

1. To provide access to Work to be tested.

2. To obtain and handle samples at the source of the product to be tested.

3. To facilitate inspections and tests.

4. For storage and curing of test samples.

F. Notification to Laboratory: Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse Owner for laboratory personnel and travel expenses incurred due to Contractor's negligence.

G. Contractor's Convenience Testing: For testing performed exclusively for Contractor's convenience, employ and pay for the services of a separate, equally qualified Independent Testing Laboratory.

1.09 SCHEDULES FOR TESTING

A. Time Required for Testing: By advance discussion with the testing agency selected by the Owner, determine the time required for the testing agency to perform its tests and to issue each of its findings. Provide all required time within the construction schedule.

B. Changes in Construction Schedules: When changes of construction schedules are necessary during construction, coordinate all such changes of schedules with the testing agency as required.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, transportation, protection, and services necessary for, and incidental to, the proper execution and completion of all Temporary Facilities and Control Work, as indicated on the Drawings and as specified herein. Work includes, but is not necessarily limited to the following:

1. Temporary Utilities: Water service and distribution, Temporary electric power and light, temporary heat, Telephone service and sanitary facilities, including drinking water.

2. Support Facilities: Field Offices, Storage sheds, Temporary Enclosures, Construction Aids and Miscellaneous services and facilities.

3. Security and Protection Facilities: Temporary fire protection, Barricades, Warning signs and Lights.

1.02 USE CHARGES

A. General: Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and faculties without, including, but not limited to, the Owner, the Design Professional, occupants of the Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: The General Contractor will pay sewer service use charges for sewer usage by all entitles for construction operations.

C. Water Service: The General Contractor will pay water service use charges for water usage by all entitles for construction operations.

D. Electric Power Service: The General Contractor will pay electric power service use charges for electricity usage by all entitles for construction operations.

1.03 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, Utility hookups, Staging areas, and Parking areas for construction personnel.

B. Erosion and Sedimentation Control Plan: Show compliance with requirements of EPA Construction General Permit of authorities having jurisdiction, whichever is more stringent. Coordinate with the Civil Engineer's drawings and specifications.

C. Moisture Protection Plan: Describe procedures and controls for protecting materials and construction form absorption and damage; including delivery, handling, and storage provisions for materials subject to water absorption or water damage, discarding water-damaged materials, protocols for mitigating water intrusion into completed work, and replacing water damaged work.

1. Indicate sequencing of work that requires water, such as plastering and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. Dust Control and HVAC Control Plan: Submit coordination drawing and narrative that indicated the dust-control and HVAC control measures proposed for use, proposed locations, and proposed time frame for their operations. Dust Control shall be per TCEQ (Texas Commission of Environmental Quality) and City Ordinance requirements. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Location of dust control partitions at each phase of the work.

2. HVAC system isolation schematic drawing.

3. Location of proposed air filtration system discharge.

4. Other dust control measures.

5. Waste management plan.

1.04 QUALITY ASSURANCE

A. General: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, Building Code, City Ordinance Requirements, Health and safety regulations and Utility Company 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 NECA, NEMA, and UL Standards and regulations and requirements of authority having jurisdiction for temporary electric service. Install service in compliance with NFPA 70 “National Electric Code.”

2. Accessible Temporary Egress: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ANSI A117.1.

C. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.05 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.

B. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before the Owner’s acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.01 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. Chain Link Fencing: Minimum 0.148 inch thick, galvanized steel, chain link fabric fencing; minimum 8 feet high with galvanized steel pipe posts; minimum 2 3/8 inch OD line posts and 2 7/8 inch OD corner and pull posts, with 1 5/8 inch OD top rails.

C. Portable Chain Link Fencing: Minimum 0.148 inch thick, galvanized steel, chain link fabric fencing; minimum 8 feet high with galvanized steel pipe posts; minimum 2 3/8 inch OD line posts and 2 7/8 inch OD corner and pull posts, with 1 5/8 inch OD top and bottom rails. Provide galvanized steel bases for supporting post.

D. Lumber and Plywood: Comply with requirements in Division 6 Section “Rough Carpentry.”

E. Tarpaulins: Provide waterproof, fire resistant, UL Labeled tarpaulins with flame spread rating of 15 of less per ASTM E84. For temporary enclosures, provide translucent, nylon reinforced, laminated polyethylene or poly vinyl chloride, fire retardant tarpaulins.

F. Polyethylene Sheet: Reinforced, fire resistance sheet, 10 mils minimum thickness, with flame spread rating of 15 of less per ASTM E84.

G. Dust control Adhesive Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches.

H. Insulation: Unfaced mineral fiber blanket, manufacturer from glass, slag wool, or rock wool; with maximum flame spread of 25 and smoke developed indexes of 50 per ASTM E84.

I. Water: Provide potable water approved by local health authorities.

2.02 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls and foundations adequate for normal loading.

B. A Job Site Trailer: Of sufficient size to accommodate needs of the Owner and construction personnel office activities and to accommodate project meetings. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for project site documents including file cabinets, plan table, plan racks, and bookcases.

2. Conference room of sufficient size to accommodate meeting of 10 individuals. Provide electrical power service and 120 V AC duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4 foot square tack and marker boards.

3. Drinking water and private toilet.

4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.

5. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

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

1. Store combustible materials apart from building.

2.03 EQUIPMENT

A. General: Provide new materials. If acceptable to the Architect, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide ¾ inch, heavy-duty, abrasion resistant, flexible rubber hoses 100 feet long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA polarized outlets to prevent insertion of 110 to 112 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.

D. 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.

E. Lamps and Light fixtures: Provide general service efficient 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.

F. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system; provide vented, self contained, liquid propane gas or fuel oil heaters with individual thermostatic control.

1. Use of gasoline burning heaters, open flame heaters, or salamander type heating units is prohibited.

2. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

3. Permanent HVAC Systems: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at the end of construction and clean HVAC system as required in Division 01 Section “Closeout Procedures.”

G. Temporary Offices: Provide prefabricated or mobile units or similar job built construction with lockable entrances, operable windows, and serviceable finishes. Provide heat heated and air conditioned unit on foundations adequate for normal loading.

H. Temporary Toilet Units: Provide self contained, single occupant toilet units of chemical, aerated recirculation, or combustion type. Provide units properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.

I. 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

3.01 INSTALLATION, GENERAL

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.

1. Locate facilities to limit site disturbance as specified in Division 01 Section “Summary.”

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.

3.02 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. Use Charges: Neither the Owner nor Architect will accept cost or use charges as a basis of claims for Change Orders. The contractor can connect to existing water and electrical service and the owner will pay use charges for water and electricity. The contractor shall provide all other use charges including cost for temporary heat.

B. Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use. Obtain all required permits.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

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

1. Provide dehumidification systems to maintain the facilities when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

F. Electric Power Service: Provide power service and distribution system of sufficient size, number of phases, capacity, and power characteristics required for construction operation and testing of all installed equipment.

1. Install electric power service overhead, unless otherwise indicated.

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

1. Install and operate temporary lighting that fulfills security and protection requirements without operating the entire system.

H. Telephones Service: Provide temporary telephone service in Owner’s use facilities for use by all construction personnel. Install two telephone lines for each field office. One telephone to be dedicated for facsimile machine in each field office.

1. At each telephone, post a list of important telephone numbers, including but not limiting to, Police & Fire departments, Contractor's home Office, Design Professional's office, Testing Consult's office, Owner's office, principal subcontractors' field & home offices and superintendent's cellular telephone.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within the construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with requirements of NFPA 241

2. Maintain support facilities until near Substantial Competition inspection date is scheduled. Remove prior to substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

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

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

2. Prepare sub grade and install sub base and base for temporary roads and paved areas specified in individual specification sections.

3. Delay installation of final course of permanent hot mix asphalt pavement until immediately before Substantial Completion. Repair hot mix asphalt base course pavement before installation of final course.

C. Traffic Controls: comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.

2. Maintain access for firefighting equipment and access to fire hydrants.

D. Parking: Provide temporary areas for construction personnel.

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

1. Dispose of rainwater in a lawful manner that will not result in flooding the project or adjoining properties nor endanger permanent work of temporary facilities.

2. Remove snow and ice as required to minimize accumulations.

F. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, freezing, other construction operations, and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 sq. ft. or less with plywood or similar material.

3. Close openings through floor or roof decks and horizontal surfaces with load bearing, wood framed construction.

4. Where temporary wood or plywood enclosure exceeds 100 sq. ft. in area, use UL labeled, fire retardant treated material for framing and main sheathing.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil bearing water runoff and airborne dust to undisturbed areas and to

adjacent properties and walkways, according to erosion and sedimentation control drawings.

C. Storm water Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and sub grade construction to prevent flooding by runoff of storm water from heavy rains.

D. Tree and Plant Protection: Install temporary fencing outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to the Owner.

F. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

I. Temporary Fire Protection: Install and maintain temporary fire protection facilities of the type 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.

2. Store combustible materials in containers in fire safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, 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.

3.05 MOSTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.

2. Protect stored and installed material from flowing or standing water.

3. Keep porous and organic materials from coming into prolonged contact with concrete.

4. Remove standing water from decks.

5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with High organic content, into partially enclosed building.

2. Keep interior spaces reasonably clean and protected from water damage.

3. Periodically collect and remove waste containing cellulose or other organic matter.

4. Discard or replace water-damaged material.

5. Do not install material that is wet.

6. Discard, replace or clean stored or installed material that begins to grow mold.

7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.

2. Use permanent HVAC system to control humidity.

3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.

b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record daily readings over a forty eight hour period. Identify materials containing moisture levels higher than allowed. Report findings in writing to the Design Professional.

c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.06 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 conditional 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. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. 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. Material and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. 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 temporary entrances, as required by authorities having jurisdiction.

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period. Comply with final cleaning requirements specified in Section 01 70 00 – Project Closeout.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:
1. Section 01 25 00 "Substitution Procedures" for requests for substitutions.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

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

1.4 ACTION SUBMITTALS

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

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Project Closeout."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
    b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

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

1. Evidence that the proposed product does not require revisions to the Contract Documents that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 70 00
PROJECT CLOSEOUT

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Closeout Work shall include preparation for final acceptance, occupancy, and similar actions evidencing completion of the Work. The time of closeout is recognized to be directly related to “Substantial Completion”, and therefore may be either a single time period for the entire Work or a series of time periods for individual parts of the Work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section, regardless of whether resulting from “phased completion” originally specified by the Contract Documents or subsequently agreed upon.

1.02 PREREQUISITES FOR SUBSTANTIAL COMPLETION

A. General: Prior to Certification of Substantial Completion, submit one (1) set of the following documents to the Owner, and list known exceptions:

1. Submit statement showing final accounting of changes to the Contract Sum.

2. Advise of pending insurance change-over requirements.

3. Submit guarantees, warranties, workmanship bonds, maintenance agreements, final certifications and similar documents. Submit list of contacts, including company name, personal contact, address, telephone number and e-mail for building equipment and components which may require periodic service, including roofing, mechanical and electrical equipment.

4. Obtain and submit occupancy permits, operating certificates, final inspection/test certificates, and similar releases enabling full and unrestricted use of the Work and access to services and utilities.

5. Submit record (As-Built) Drawings, operation and maintenance manuals, Subcontractor listing with address, telephone number and e-mail, final Project photographs, damage or settlement survey, property survey, and similar final record information.

B. Tools, Spare Parts, and Extra Stock Materials: Deliver tools, spare parts, extra stocks of materials, and similar physical items.

C. Locks and Keys: Make final change-over of locks and transmit keys to Owner or Tenant, and advise to change-over in security provision.

D. Testing of Systems: Complete start-up testing of systems, and instruction of operating/maintenance personnel.

E. Temporary Facilities and Services: Discontinue (or change over) and remove from the Project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.

F. Final Cleaning: Complete the final cleaning.

G. Exposed Finish Surfaces: Touch-up, repair, and restore marred exposed finishes.

H. Meter Readings for Temporary Utilities: Submit final meter readings for temporary utilities, measured record of stored fuel, and similar data as of the time of substantial completion or when Owner took possession of, and responsibility for, corresponding elements of the Work.

1.03 PREREQUISITES TO FUNCTIONAL COMPLETION

A. All TAB (Test, Adjust and Balance) work must be complete prior to Functional Completion, unless approved in writing by the Owner's Project Manager. Exceptions to this are the planned control system training performed after occupancy and any required seasonal or approved deferred testing. This includes for all systems, but is not limited to:

1. Completed and signed start-up and prefunctional checklist documentation.

2. Requested trend log data.

3. Submission of final approved TAB report.

4. Completion of all functional testing.

5. Required training of Owner personnel completed and approved.

6. Submission of the approved O & M manuals.

7. All identified deficiencies have been corrected or are approved by the Owner to be accepted from this milestone.

B. The Owner's Project Manager will determine the date of Functional Completion.

1.04 RECORD DOCUMENT SUBMITTALS

A. General: Specific requirements for record documents are indicated in individual sections of the Specifications. The general requirements are indicated in the General Conditions, with additional provisions indicated in Section 01 01 00 - General Scope of Work, and Specification Divisions as required for Mechanical and Electrical Work, respectively. DO NOT USE record documents for construction purposes; protect from deterioration and loss in a secure fire-resistive location.

B. Record Drawings:

1. Contractors shall keep an accurate record of “As-Built” conditions as the Work progresses. Mark-up Drawings to indicate variance, at the time the variance occurs.

2. Maintain a white print set (blue line or black line) of complete Construction Documents and Shop Drawings, in clean undamaged condition, for the purpose of checking and recording all installations which vary substantially from the Work as originally shown. The records shall include changes in sizes, locations, and dimensions, as well as any resulting from Bulletins, Change Orders, or Field Orders.

3. Mark whichever Drawing is most capable of showing the “As-Built” condition fully and accurately; however, where Shop Drawings are used for mark-up, record a cross-reference at the corresponding location on the Contract Drawings.

4. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations of separate categories of Work.

5. Mechanical and Electrical Contractors shall give particular attention to concealed Work, and record all concealed mechanical and electrical services by color code. Record shall include exact locations of pipe, conduit, wire and cable, valves and all underground or otherwise concealed Mechanical and Electrical Work, properly dimensioned from adjacent building walls and with invert elevations noted. Record shall include all principal dimensions of concealed Work and any special notations such as valve numbers.

6. Obtain a complete set of reproducibles using the Architect’s original tracings and any Shop Drawings used for Record Drawings. Transfer all corrections, changes, and revisions from the job record set to the reproducibles and add to the legend “Record Drawings” and the date of printing to each reproducible. Within thirty (30) days of completion of job, print one (1) complete set of blacklines or blueprints. The reproducible and blacklines or blueprints shall become the property of the Owner.
7. Organize Record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

C. Maintenance Manuals:

1. Organize maintenance and operating manual information into individual binders properly identified, indexed, and thumb tabbed, such as Building Maintenance, Tile Maintenance, Roof Maintenance. Include names, addresses, telephone numbers, and e-mails of equipment vendors and Subcontractors. Submit one (1) copy to the Owner within thirty (30) days of Substantial Completion to be retained by the Owner for his records and use.

2. Include information such as emergency instructions, spare parts listing, warranties and guarantees with name, telephone number and e-mail of contact person, wiring diagrams, recommended “turn-around” cycles, inspection procedures, Shop Drawings, Product Data, names and addresses of each supplier, names and addresses of contractor and sub-contractors with contact person telephone number, e-mails, and similar applicable information.

3. Bind each manual of each set in a heavy-duty, 3-ring, vinyl-covered binder (not less than 2" capacity), and include pocket folders for folded sheet information. Mark identification on the front and spine of each binder.

1.05 CLOSEOUT PROCEDURES

A. General Operating/Maintenance Instructions: Arrange for each installer of Work requiring continuing maintenance or operation, to meet with personnel at the Project site to provide instructions needed for proper operation and maintenance of all equipment or components.

1. Include instructions by manufacturer’s representatives where installers are not expert in the required procedures.

2. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities.

3. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, and similar operations.

4. Review maintenance and operations in relation with applicable guarantees, warranties, agreements to maintain, bonds, and similar continuing commitments.

1.06 FINAL CLEANING

A. General: Provide cleaning for specific units of Work as specified within the Specifications Sections listed under the Table of Contents in the Project Manual. Provide final cleaning of the Work, at the time indicated, consisting of cleaning each surface or unit of Work to the normal “clean” condition expected for a first-class building cleaning and maintenance program. Comply with manufacturers' instructions for cleaning operations.

B. Cleaning Requirements: The following are examples, but not by way of limitation, of the cleaning levels required, including removing all marks, stains, soil, and fingerprints from all completed Work.

1. Remove manufacturer's or contractor's labels which are not required as permanent. Remove protective coverings and tags, except for those required to demonstrate compliance with building codes, fire-ratings and testing. Also remove all residue and glue remaining on the surface.

2. Clean transparent and reflective glass materials, including window/door glass and mirrors with ammonia-type, non-streaking glass cleaner, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken or damaged glass and mirrors.

3. Clean exposed exterior and interior hard-surface finishes, including metals, masonry, stone, concrete, painted surfaces, plastics, tile, wood, and similar surfaces, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated; avoid the disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

4. Wipe surfaces of mechanical and electrical equipment clean, and remove excess lubrication and other substances. Change filters within HVAC equipment.

5. Remove debris and surface dust from limited-access spaces including roofs, plenums, trenches, manholes, attics and similar spaces.

6. Clean concrete floors in non-occupied spaces broom clean.

7. Vacuum clean soft material surfaces, such as carpeted and similar surfaces.

8. Clean, sanitize and polish all fixtures, and washable surfaces in the Toilet Rooms. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

9. Damp wipes and cleans all fixtures, including light fixtures and lamps so as to function with full efficiency. Replace burned-out or broken lamps.

10. Wash, clean and polish all porcelain and/or ceramic tile surfaces.

11. Remove and dispose of all trash, scraps, packing, and all other construction debris.

12. Clean Project site (yard and grounds), including landscape, development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition;

remove stains, petro-chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.

C. Damages: Any damage caused by Contractors with cleaning equipment shall be repaired or replaced by the Contractor responsible for the damage.

D. Time of Final Cleaning: Following certification of “Substantial Completion”.

1.07 PEST CONTROL

A. Engage an experienced exterminator to make a final inspection of the Project, and to eliminate the Project of rodents, insects, and other pests. Comply with governing regulations and applicable health and safety standards.

1.08 REMOVAL OF PROTECTION

A. Except as otherwise indicated or requested, remove temporary protection devices and facilities which were installed during the course of the Work to protect previously completed Work during the remainder of the construction period.

1.09 COMPLIANCES

A. Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at the site, or bury debris or excess materials on the Owner’s property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from the site and dispose of in a lawful manner. At no time during or at completion of construction, place any excess material, into Owner’s compactor or container.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

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-installed products.

6. Progress cleaning.

7. Starting and adjusting.

8. Protection of installed construction.

9. Correction of the Work.

B. Related Requirements:

1. Section 01 33 23 "Shop Drawings and Samples".

2. Section 01 70 00 "Project Closeout" Procedures for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

3. Section 078456 and 079000 for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor professional engineer.

B. Certificates: Submit certificate signed by land surveyor professional engineer certifying that location and elevation of improvements comply with requirements.

C. 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.

D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

E. Final Property Survey: Submit 6 copies showing the Work performed and record survey data.

1.5 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. 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, 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 result in increased maintenance or decreased operational life or safety. Operational elements include the following; but not limited to:

a. Primary operational systems and equipment.

b. Fire separation assemblies.

c. Air or smoke barriers.

d. Fire-suppression systems.

e. Mechanical systems piping and ducts.

f. Control systems.

g. Communication systems.

h. Fire-detection and -alarm systems.

i. Conveying systems.

j. Electrical wiring systems.

k. 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 those 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.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: 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.

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, 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.

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 and 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to 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. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. General: Engage a land surveyor professional engineer to lay out the Work using 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 and Construction Manager 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 and Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager 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.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.

2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: 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 in occupied spaces and 90 inches in unoccupied spaces.

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 the best possible results. 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.

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: Do not use tools or equipment that produce harmful 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 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.

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. Fit exposed connections together to form hairline joints.

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

3.6 CUTTING AND PATCHING

A. Cutting and Patching, 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. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. 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 interruption to occupied areas.

G. 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.

H. 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. 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 minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. 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 OWNER- INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

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. Pre-installation Conferences: Include Owner's construction personnel 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. General: 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.

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 in Finished Areas: 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 assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

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

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

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

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

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

END OF SECTION

SECTION 01 81 19
INDOOR AIR QUALITY REQUIREMENTS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, transportation, protection, and services necessary for, and incidental to, the proper execution and completion of all Indoor Air Quality Requirements, as specified herein. Work includes, but is not necessarily limited to the following:

1. Construction procedures to promote adequate indoor air quality after construction.

2. Building flush-out after construction and before occupancy.

3. Testing indoor air quality after completion of construction.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. HVAC Filters - Section 24 40 00.

2. Testing, adjusting, and balancing for HVAC - Section 23 05 93.

1.02 PROJECT GOALS

A. Maintain a healthy environment for the present and future occupants of the building. Therefore, the Contractor shall conduct the work in such a way as to avoid creating indoor air quality problems.
Required procedures:

1. Limiting use of products that may contribute to poor indoor air quality.

2. Maintaining work procedures which contain and alleviate dusts and odors and air-borne contaminants.

3. Protection of materials from moisture.

B. The Contractor’s attention is directed to provisions throughout the Contract Documents intended to maintain indoor air quality during construction and after completion of the Project. These provisions will be strictly enforced. The Contractor shall notify and require

each subcontractor, sub-subcontractor and materials vendors to comply with such provisions.

1.03 DEFINITIONS

A. Definitions Pertaining to Sustainable Development: As defined in ASTM E2114.

B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of particulates, dust, fumes, vapors, or gases.

C. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabric, fibrous insulation, and other similar products.

D. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

E. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, requires a Material Safety Data Sheet (MSDS) in accordance with 29 CFR 1910.1200, or which during end use, treatment, handling, storage, transportation or disposal meets or has components which meet or have the potential to meet the definition of a Hazardous Waste in accordance with 40 CFR 261. Throughout this specification, hazardous material includes hazardous chemicals.

1. Hazardous materials include: pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).

F. Indoor Air Quality (IAQ): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the relative quality of air in a building with respect to contaminants and hazards and is determined by the level of indoor air pollution and other characteristics of the air, including those that impact thermal comfort such as air temperature, relative humidity and air speed.

G. Interior final finishes: Materials and products that will be exposed at interior occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.

H. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles, and insulation.

I. Particulates: Dust, dirt, and other airborne solid matter.

J. Wet products: Materials and products installed in wet form, including paints, sealants, adhesives, special coatings, and other materials which require curing.

K. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.04 REFERENCE STANDARDS

A. American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE): ASHRAE Standard 62 -2007, Ventilation for acceptable Indoor Air Quality.

B. American National Standards Institute (ANSI)/ASHRAE Standard 52.2 -1999: Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

C. Sheet Metal and Air Conditioning National Association (SMACNA): “IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007” and Duct Cleanliness for New Construction Guideline.” D. U.S. Environmental Protection Agency Compendium of Method for Determination of Air Pollutants in Indoor Air.

1.05 PERFORMANCE REQUIREMENTS

A. VOC Emissions: Products have been selected for this Project with respect to their emissions of Volatile Organic Compounds, in order to limit concentrations of VOC’s in occupied spaces.

1. Substitution for any specified VOC-containing product specified will be considered with the condition that acceptable VOC-emission data are available for the proposed product, or the Contractor arranges to have that product tested for VOC emissions by an independent laboratory.

B. Airborne Dust: Dust Partitions, site dust control measures and other construction practices shall be maintained to prevent airborne dust from leaving the site or accumulating in the building interior.

C. Moisture: Weather protection, scheduling of the work, restoration drying techniques using desiccants drying, dehumidification and other construction practices shall be used to maintain the schedule and to prevent construction materials from reaching moisture levels that will support the growth of mold, bacteria and other biological contaminants.

1. Maximum Equivalent Moisture Content (EMC) of substrates installed wet or wetting during the construction process such as concrete, and concrete block shall be measured before application of mold-sensitive finishes. Installation of the following products shall not proceed until the relative humidity in the substrate does not exceed 70 percent relative Humidity (RH) as measured using ASTM F 2170, or in accordance with the manufactures ‘s written limitations, whichever is lower:

a. Non-preservative-treated wood products.

b. Gypsum Wallboard.

c. Carpet.

d. Acoustical Ceiling Tile.

e. Fabric-covered acoustical panels and tack boards.

f. Fixed upholstered seating.

2. Wood-based finish products such as flooring, architectural woodwork, casework, etc. shall additionally follow the environmental temperature and RH criteria limits established within the respective sections.

1.06 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Temporary HVAC Filters: Provide product data for during construction, at flush-out, and installed at Substantial Completion, Highlighting MERV and other performance data.

C. Indoor Air Quality (IAQ) Management Plan: Not less than 10 days before the Pre-construction meeting, prepare and submit an IAQ Management Plan; use SMACNA IAQ Guidelines for Occupied Buildings Under Construction as a guide including, but not limited to, the following:

1. Identify potential sources of odor and dust.

2. Identify construction activities likely to produce odor and dust.

3. Identify porous materials and absorptive materials.

4. Identify areas of project potentially affected, especially occupied areas.

5. Evaluate potential problems by severity and describe methods of control.

6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters, and scheduled for replacement of filters.

7. Describe cleaning and dust control procedures.

8. Describe storage and moisture protection control procedure.

9. Describe the building flush-out procedures including the dates when flush-out will begin and completed.

10. Describe coordination with commissioning procedures.

11. Describe the air contaminant test procedures including the following:

    a. Identify the Testing Agency qualifications.

    b. Identify the locations and scheduling of the air sampling.

    c. Describe Test procedures in detail.

    d. Identify the Test instruments and apparatus.

    e. Describe the sampling method.

D. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to absorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

E. Construction Documentation: Size photographs on three different occasions during construction along with brief description of the SMACNA approach employed, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive material.

F. Duct and Terminal Unit Inspection Report.

G. Air Contaminant Test Reports: Provide the follow information in the Air Contaminant Test Report, but is not limited to, the following:

1. Location where each sample was taken and time.

2. Test values for each air sample; average the values of each set of 3.

3. HVAC operating conditions.

4. Certification of test equipment calibration.

5. Other conditions or discrepancies that might have influenced the results.

H. Moisture Testing: Evidence of testing of each substrate to receive mold-sensitive finishes in accordance with ASTM F 2170.

1.07 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: Independent testing agency having minimum of 5 years experience in performing the types of testing specified.

E. Maintain at the contraction site a complete and up-to-date binder of MSDS for all products on-site containing VOC's. Upon the request of the Owner, make the binder available for review.

PART 2 - PRODUCT

2.01 MATERIALS

A. Through the Work, use products, materials which contribute the minimum practicable dust, odors, and contaminants to indoor environment.

B. Products containing Volatile Organic Compounds (VOC's):

1. Comply with the following criteria for VOC Limits for the following field-applied products.

2. No urea formaldehyde-containing products will be permitted for use in this project.

C. Indoor Chemical and Pollutant Source Control:

1. Provide temporary walk-off mats to reduce the entry of dust, moisture, and other contaminants into the building during construction.

2. Refer to Section 12 48 13 - Entrance Floor Mats and Frames, for permanent floor grilles to be installed at building entrances. These floor grilles shall be protected from dust, moisture, and other contaminants until Substantial Completion.

D. Mechanical Systems and Controls: Refer to specification sections in Divisions 21, 22, 23 and 26 for mechanical and electrical provisions for maintaining Indoor Air Quality.

PART 3 - EXECUTION

3.01 GENERAL PROCEDURES FOR PROTECTING INDOOR AIR QUALITY

A. General: Provide physical barriers, ventilation, and other controls as specified to reduce potential for odors, dust, and fumes from affecting present and future occupants of the building, and to meet performance criteria specified herein.

B. Material Transport and Storage:

1. Store construction materials, including ductwork, in clean, dry areas protected from moisture and dust. Refer to individual specification sections for additional on-site storage requirements for individual materials and equipment.

2. No Storage of construction material or debris will be permitted within mechanical rooms.

3. Adsorptive materials shall be protected throughout storage at the site in their original wrapping material.

4. Keep waste materials that can release dust or odors covered and sealed when on-site, and dispose of them promptly.

C. Installation Sequence: Schedule material installation and construction activities so as to avoid adsorption of VOC's and dust into adsorptive materials.

1. Provide protective cover for adsorptive materials that will be subjected to VOC off-gassing and dust.

a. Wrap adsorptive materials in polyethylene or other impermeable material and seal edges with tape.

b. Refer to SMACNA Guidelines for minimum requirements.

c. Protective cover is required for uninstalled materials stored in the construction area, as well as for installed materials.

2. Containers of VOC containing fluids shall be kept tightly sealed. When not in use, such containers shall be stored in a location remote from adsorptive materials or occupied areas.

3. Apply wet materials such as paints, coatings and products installed with adhesives, allowing them time to off gas before applying adsorptive or "sink" type products such as.

a. Acoustical ceiling tiles.

b. Carpet.

c. Fabric materials, upholstered products or fabric-wrapped panels for use as tack boards or acoustical purposes.

4. Permit carpeting to off gas for 48 hours at the plant prior to wrapping in plastic wrappings. Otherwise, before installation, open up carpet rolls and spread carpet

out in an offsite location and ventilate in an area protected from weather, sources of moisture or other VOC's.

D. Regular Cleaning during Construction: The intent of these documents is to prevent accumulation of contaminant-containing dirt and dust within the building during construction.

1. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

2. Use cleaning methods that minimize airborne dust. Recommended methods include:

a. Immediate removal of spills, excess applications of cleaning products, and accumulated water.
b. Increased frequency of cleaning during construction, to maintain surfaces free of dust accumulation.
c. Use of wetting agents and sweeping compounds, and of efficient dust collection equipment such as damp mops and HEPA-filtered vacuum cleaners.
d. Refer to SMACNA Guidelines for additional cleaning recommendations.

E. Protection of HVAC:

1. If extremely dusty or dirty work must be conducted inside the building, shut down HVAC systems for the duration; remove dust and dirt completely before restarting systems.

2. When working in a portion of an occupied building, prevent movement of air from construction area to occupied area.

3. HVAC equipment and ductwork may NOT be used for ventilation during construction:

a. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.

b. Exhaust directly to outside.

c. Seal HVAC air inlets and outlets immediately after duct installation.

4. HVAC equipment and supply air ductwork may be used for ventilation during construction:

   a. Operate HVAC system on 100 percent outside air, with 1.5 air changes per hour, minimum.

   b. Ensure that air filters are correctly installed prior to starting use; replace filters when they lose efficiency.

   c. Do not use return air ductwork for ventilation.

   d. Do not use return air ductwork for ventilation unless absolutely necessary.

   e. Seal return air inlets or otherwise positively isolate return air system to prevent recirculation of air; provide alternate return air pathways.

   f. Where return air ducts must be used for ventilation, install auxiliary filters at return inlets, sealed to ducts; use filters with at least the equivalent efficiency as those required at supply air side; inspect and replace filters when they lose efficiency.

5. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

   a. Inspect duct intakes, return air grilles, and terminal units for dust.

   b. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduits.

   c. Clean tops of doors and frames.

   d. Clean mechanical and electrical rooms, including tops of pipes, ducts, conduits, equipment, and supports.

   e. Clean return plenums of air handling units.

   f. Remove intake filters last, after cleaning is complete.

6. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

3.02 MIXING OF MULTI-COMPONENT PRODUCTS

A. General: Fluid-applied products furnished in two or more components shall be mixed thoroughly, in precise proportions so that an excess of one component will not remain

uncured. The requirements of this section apply to all fluid-applied multi-component products, including but not limited to the following:

1. Multi-component adhesives.

2. Multi-component waterproofing and sealant products.

3. Multi-component paints and coatings

4. Multi-component fluid-applied floorings

B. Requirements:

1. All multi-component mixtures shall be brought to the Project Site in factory-sealed and premeasured containers with precise quantities required for proportional mixing. No bulk materials will be permitted on-site if not packaged in this manner.

2. Mix components in strict accordance with manufacturer's written instructions regarding quantities, mixing method and other conditions.

3. Each container of each component shall be completely mixed with the entire contents of a corresponding container of the second component.

a. No field mixing of partial quantities will be permitted.

b. Properly dispose of mixed components remaining unused at the end of a workday.

3.03 CONTROL OF COMBUSTION PRODUCTS

A. General: Minimize the use of fuel-burning equipment inside and near the building. Where fuel-burning engines are necessary, cycle off equipment when not in use.

B. Vehicle Exhaust: No vehicles shall be left idling near temporary or permanent air intakes. Motorized vehicles used within the building shall be electrically powered.

C. Power Equipment: No internal combustion engines shall be operated within the building. Location of engines outside the building shall be remote from permanent air intakes and operable windows of occupied spaces.

D. Exhaust of Temporary Heating Equipment:

1. No temporary heating equipment that burns kerosene or other liquid fuel will be permitted within the building.

2. Temporary equipment that produces heat by combustion of fuel shall be installed with provisions to ventilate combustion gases to the exterior of the building.

E. Welding: Welding operations shall be properly ventilated.

F. Smoking: No smoking will be permitted within the construction site or adjacent areas at any time.

3.04 DUST CONTROL

A. General: The following provisions do not supersede specific requirements for methods of construction or applicable general conditions set forth elsewhere in the Contract with regard to performance obligations of the Contractor.

1. Maintain the construction site, stockpiles, access, detour, and haul roads, staging, and parking area used for the Work, free of dust that would cause a hazard or a nuisance to those at the site or adjacent sites. Refer to Section 31 00 00 - EARTHWORK, for additional provisions for control of dust on the site.

2. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and use damp cloths and wetting agents or sweeping compounds to prevent air-borne dust from dispersing into the atmosphere.

3. Cutting of concrete and masonry products shall be performed using wet saw methods.

4. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

5. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

6. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces, including paint, coatings, sealants, caulking, and adhesives.

B. Dust Partitions and Coverings:

1. Furnish, erect, and maintain for the duration of the work period, temporary fire-resistant dustproof coverings and solid partitions as required to prevent the spread of dust beyond the immediate area where work is being performed.

2. Temporary partitions for dust control shall extend from floor to bottom of structure above, to provide an air-tight barrier. Provide air-tight coverings for openings required for access through partitions.

3. Cover equipment installed within construction area using canvas, polyethylene tape, or other materials as recommended by manufacturer of equipment for protection from airborne dust and vapors.

4. Refer to Section 01 50 00 – Temporary Facilities and Controls, for additional requirements for temporary partitions and related protective measures.

C. Prevent dust and odors from entering the new HVAC system. Confirm that the HVAC Subcontractor has sealed all diffusers, return side ductwork, and equipment within the Work Area so as to prevent dust from entering. For further requirements, refer to SMACNA Guidelines and DIVISION 23 – Heating, Ventilating, and Air Conditioning.

D. Prevent exterior dust and odors from entering interior space after building is enclosed. Whenever possible, seal window units with plastic as recommended in SMACNA Guidelines.

3.05 WATER DAMAGE

A. General: The General Contractor shall be responsible for protecting the Work from moisture, in order to prevent growth of harmful fungus, mold, and other biological activity.

B. Protection of Existing and New Building Construction:

1. Refer to Section 01 50 00 - Temporary Facilities and Controls, for materials and installation of weatherproof enclosures.

2. Remove and replace construction that becomes wet, or that shows evidence of biological growth due to the presence of moisture.

C. Protection of Stored Construction Materials:

1. Take precautions to prevent porous materials such as gypsum board, insulation, ceiling tile, wood, and similar products from becoming wet.

2. Refer to Section 01 50 00 - Temporary Facilities and Controls, for materials and installation of weatherproof enclosures.

3. Store materials above ground surfaces and provide spacers between the ground and protective covering to allow for ventilation.

4. Discard construction material that becomes wet, or that shows evidence of biological growth due to the presence of moisture.

D. Procedures for drying out wet construction: In the case that an unanticipated event permits the entry of water into new or existing construction, the Contractor shall perform procedures to dry out construction within 24 hours, to a degree that will not support biological growth using restoration drying techniques.

1. Refer to guidelines published by the United States Environmental Protection Agency.

2. Construction that is not adequately dried out, or which shows evidence of biological growth, shall be removed immediately from the construction area and disposed of legally.

3. Wetting by contaminated water and subsequent cleaning and decontamination shall be supervised by a qualified company.

3.06 CLEAN UP

A. Prior to turning over work area to Owner, conduct final cleaning to remove dust to the minimum practicable level.

B. Clean ductwork, registers and grilles within the Work Area, and HVAC equipment servicing the Work Area using professional duct cleaning company.

C. After completion of duct cleaning, vacuum vertical and horizontal surfaces, ledges, trim, tops of light fixtures and other equipment, and other locations where dust has settled. Utilize HEPA-filtered vacuum to capture fine dust.

D. Vacuum carpet tiles and fabric-covered surfaces with a high-efficiency particulate arrestor (HEPA) vacuum prior to Substantial Completion.

E. Do not use solvent-based cleaners in final cleaning of Work Area, unless cleaning occurs at least 14 days prior to Owner’s scheduled Active Use of the area.

F. Coils, air filters, and fans in HVAC system shall be cleaned prior to final testing and balancing. Refer to Division 23 - HVAC, for requirements.

3.07 BUILDING FLUSH-OUT

A. Contractor’s Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform building flush-out before occupancy.

C. Do not start flush-out until:

1. All construction is complete.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.

4. Inspection of inside of return air ducts and terminal units confirms that cleaning is not necessary.

5. New HVAC filtration media have been installed.

D. Building Flush-Out: Operate all ventilation systems at normal flow rates with 100 percent outside air until a total air volume of 14,000 cubic feet per square foot of floor area has been supplied.

1. Obtain concurrence that construction is complete enough before beginning flush-out.

2. Maintain interior temperature of at least 60 degrees F and interior relative humidity no higher than 60 percent.

3. If additional construction involving materials that produce particulates or any of the specified contaminants is conducted during flush-out, start flush-out over.

4. If interior spaces must be occupied prior to completion of the flush-out, supply a minimum of 3,500 cubic feet per square foot of floor area prior to occupancy, and:

a. Begin ventilation at least three hours prior to daily occupancy.

b. Continue ventilation during all occupied periods until total air volume of 14,000 cubic feet per square foot of floor area has been achieved.

c. Provide minimum outside air volume of 0.30 cfm per square foot or design minimum outside air rate, whichever is greater.

E. Install new HVAC filtration media after completion of flush-out and before occupancy or further testing.

3.08 AIR CONTAMINANT TESTING

A. Contractor’s Option: Either full continuous flush-out OR satisfactory air contaminant testing is required, not both.

B. Perform air contaminant testing before starting construction, as baseline for evaluation of postconstruction testing.

C. Perform air contaminant testing before occupancy.

D. Do not start air contaminant testing until:

1. All construction is complete, including interior finishes.

2. HVAC systems have been tested, adjusted, and balanced for proper operation.

3. Cleaning of inside of HVAC ductwork, specified elsewhere, has been completed.

4. New HVAC filtration media have been installed.

E. Indoor Air Samples: Collect from spaces representative of occupied areas:

1. Collect samples while operable windows and exterior doors are closed, HVAC system is running normally as if occupied, with design minimum outdoor air, but with the building unoccupied.

2. Collect samples from spaces in each contiguous floor area in each air handler zone, but not less than one sample per 25,000 square feet take samples from areas having the least ventilation and those having the greatest presumed source strength.

3. Collect samples from height from 36 inches to 72 inches above floor.

4. Collect samples from same locations on 3 consecutive days during normal business hours; average the results of each set of 3 samples.

5. Exception: Areas with normal very high outside air ventilation rates, such as laboratories, do not need to be tested.

6. When retesting the same building areas, take samples from at least the same locations as in first test.

F. Outdoor Air Samples: Collect samples at outside air intake of each air handler at the same time as indoor samples are taken.

G. Analyze air samples and submit report.

H. Air Contaminant Concentration Determination and Limits:

1. Carbon Monoxide: Not more than 9 parts per million and not more than 2 parts per million higher than outdoor air.

2. Airborne Mold and Mildew: Measure in relation to outside air; not higher than outside air.

3. Formaldehyde: Not more than 27 parts per billion.

4. Total Volatile Organic Compounds (TVOC): Not more than 500 micrograms per cubic meter.

5. 4-Phenylcyclohexene (4-PCH): Not more than 6.5 micrograms per cubic meter.

6. Particulates (PM10): Not more than 50 micrograms per cubic meter.

7. Regulated Pollutants: Measure in relation to outside air; not more than contained in outside air.

I. If air samples show concentrations higher than those specified, ventilate with 100 percent outside air and retest at no cost to Owner, or conduct full building flush-out specified above.

END OF SECTION

DOCUMENT 02 28 20
TERMITE CONTROL

PART I - GENERAL

1.01 DESCRIPTION

A. Provide soil treatment for termite control, as herein specified.

1.02 QUALITY ASSURANCE

A. In addition to the requirements of these specifications, comply with manufacturer's instructions and recommendations for the work, including preparation of substrate and application.

B. Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

B. To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with other handling and application instructions of the soil toxicant manufacturer.

1.04 SUBMITTALS

A. Comply with applicable provisions of Section 01 33 23.

B. Guarantee: Furnish 2 copies of written guarantee certifying that the applied soil poisoning treatment will prevent the infestation of subterranean termites and, that if subterranean termite activity is discovered during the guarantee period, the Contractor will retreat the soil and also repair or replace damage caused by termite infestation. Provide guarantee for a period of 5 years from date of treatment, signed by the Applicator and the Contractor.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Soil Treatment Solution

1. Use an emulsifiable concentrate insecticide for dilution with water, specially formulated to prevent infestation by termites. Fuel oil will not be permitted as a diluent. Provide a working solution of one of the following chemical elements and concentrations:

a. Dursban TC, 1.0% in water emulsion

b. Aldrin, 0.5% in water emulsion

c. Termide, 0.75% in water emulsion

d. Heptachlor, 0.5% in water emulsion

2. Other solutions may be used as recommended by Applicator and if acceptable to local governing authorities. Use only soil treatment solutions which are not injurious to planting.

PART 3 - EXECUTION

3.01 INSPECTION

A. Applicator must examine the areas and conditions under which soil treatment for termite control is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Applicator.

3.02 APPLICATION

A. Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicant may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat the soil before concrete slabs are poured using either power sprayer or tank-type garden sprayer.

    a. Apply 4 gallons (15.1 liters) of chemical solution per 10 lin. ft. (3.0 m) to the soil critical areas under the slab, such as along the inside of foundation walls, along both sides of interior partition walls, and around plumbing.

    b. Apply one gallon (3.78 liters) of chemical solution per 10 sq. ft. (0.9 sq. m) as an overall treatment under the slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallons (5.67 liters) is washed gravel or other coarse absorbent material.

    c. Apply 4 gallons (15.1 liters) of chemical solution per 10 lin. ft. (3.0 m) of trench, for each foot (0.3 m) O.C. and apply chemical solution. Mix the chemical solution with the soil as it is being replaced in the trench.

C. Allow not less than 12 hours for drying after application, before beginning concrete placement or other construction activities.

D. Post signs in the areas of application warning workers that soil poisoning has been applied. Remove signs when areas are covered by other construction.

E. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF DOCUMENT

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

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

B. Related Requirements:

1. Section 010100 "General Scope of Work" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
3. Section 017300 "Execution" for cutting and patching procedures.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

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

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

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

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

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building manager's and other tenants' on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Predemolition Photographs or Video: Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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

1. Before selective demolition, Notify Owner for the removal of items.

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

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

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

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

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

1. Maintain fire-protection facilities in service during selective demolition operations.

1.10 WARRANTY

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

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

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

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

E. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
2. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

F. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, preconstruction videotapes, and templates.

1. Comply with requirements specified in Section 01 32 33 "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 01 01 00 "General Scope of Work."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner and/or Building Manager will arrange to shut off indicated services/systems when requested by Contractor.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

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

1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."

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

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

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

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

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Work in Historic Areas: Selective demolition may be performed only in areas of the Project that are not designated as historic. In historic spaces, areas, and rooms or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 013591 "Historic Treatment Procedures."

C. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

D. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

E. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

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

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

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

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."Do not use methods requiring solvent-based adhesive strippers.

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

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Existing Items and Construction to be removed to be coordinated with Owner.

B. Existing Items to Be Removed and Salvaged to be coordinated with Owner

C. Existing Items to Be Removed and Reinstalled to be coordinated with Owner.

D. Existing Items to Remain to be coordinated with Owner.

END OF SECTION

SECTION 03 35 00
CONCRETE FINISHING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Perform all work required to complete the Concrete Finishing indicated by the Contract Documents and furnish all supplementary items necessary for its proper execution.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 specification sections, apply to work of this section.

1.3 CODES AND STANDARDS

A. Work described in this Section, unless otherwise noted on the Drawings, or herein specified, shall be governed by the latest editions of the following codes or specifications.
1. ACI 301, "Specifications for Structural Concrete for Buildings".
2. ACI 305, "Hot Weather Concreting".
3. ACI 306, "Cold Weather Concreting".
4. ACI 311, "ACI Manual of Concrete Inspection".
5. ACI 318, "Building Code Requirements for Reinforced Concrete".
6. ASTM C309, Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete.

1.4 PROJECT DATA

A. Submit copies of manufacturer's literature for all products.

1.5 FINISHING TOLERANCES

A. Tolerances:
1. Construct formwork to provide concrete surfaces conforming to tolerances of Section 3.3, ACI 347.
2. Establish and maintain, in an undisturbed condition and until final completion of project, sufficient control points and bench marks to be used for reference purposed to check tolerances.
3. Regardless of tolerances specified herein, no portion of building shall extend beyond legal boundary of project.
4. Floor Finished Surface Flatness and Levelness (random traffic areas):
a. Floor slabs shall conform to the following ACI F-number requirements:

Slab on grade: Specified Overall Value: Ff25/fl20
Minimum Local Value: Ff17/Fl15

b. When tested in accordance with the requirements of ASTM E1155, the

following percentages of elevation samples on a Test Surface shall fall within a level 3/4" envelope. Percentages apply to the entire Test Surface.

Slab on grade: 90%

The arithmetic mean of these elevation samples shall not deviate from design grade more than the following amounts:

Slab on grade: 0.25"

PART 2 PRODUCTS

2.1 MATERIALS

A. Liquid Membrane-Forming Curing Compound: Liquid type water-based membrane-forming dissipating curing compound complying with ASTM C 309.

1. "1100 - Clear"; W.R. MEADOWS. Curing Compound must be compatible with floor sealer.

PART 3 EXECUTION

3.1 FORMED SURFACES

A. As-Cast Rough Form Finish: Rough or board form finish surfaces shall be reasonable true to line and plane with no specific requirements for selected facing materials. Defects shall be patched and fins exceeding 1/4" in height shall be rubbed down with wooden blocks. Otherwise, surfaces shall be left with the texture imparted by the forms.

B. As-Cast Smooth Form Finish: Form facing materials shall produce a smooth, hard, uniform texture on the concrete. It may be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper or other material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to a practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edges, patches, dents or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

3.2 REPAIR OF DEFECTIVE AREAS

A. All honeycombed and other defective concrete shall be removed down to sound concrete. If chipping is necessary the edges shall be perpendicular to the surface or slightly undercut. No feather edges will be permitted.

B. The area to be patched and an area at least 6 inches wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared, using a mix of approximately one part cement to one part fine sand

passing a No. 30 mesh sieve, mixed to the consistency of thick cream, and then well brushed into the surface.

C. The patching mixture shall be made of the same materials and of approximately the same proportions as used for the concrete, except that the course aggregate shall be omitted and the mortar shall consist of not more than one part cement to 2 1/2 parts sand by damp loose volume.

D. White Portland Cement shall be substituted for a part of the gray Portland Cement on exposed concrete in order to produce a color matching the color of the surrounding concrete, as determined by a trial patch. The quantity of mixing water shall be no more than necessary for handling and placing.

E. The patching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

F. After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to lose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the patch slightly higher than the surrounding surface.

G. To permit initial shrinkage, it shall be left undisturbed for at least one hour before being finally finished. The patched area shall be kept damp for 7 days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.

H. All high points on the building slab that do not meet the required tolerance will be ground down to tolerance.

3.3 SLAB SURFACES

A. Troweled Finish:
1. The surface shall be finished first with impact power floats, then with power trowels. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but, which may still contain some trowel marks.
2. Additional trowelings shall be done by power trowel after the surface has hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the final troweling operations.
3. The finished surface shall be free of any trowel marks and shall be uniform in texture and appearance and shall be plane to a required tolerance. High points of the finished slab, which do not meet tolerance requirements shall be removed by grinding.
4. Slab shall be cured for a minimum of seven (7) days with a spray of concrete curing compound. Curing compound shall be applied per manufacturers recommendations.
5. Slab shall be free of holes, nails, embeds or other objectionable items at completion of construction.

3.4 SCHEDULE OF FINISHES

A. As-Cast Rough Form Finish: All concrete surfaces below grade.

B. As-Cast Smooth Form Finish: All interior and exterior concrete surfaces exposed to view.

C. Troweled Finish: Floor surfaces scheduled as exposed or to receive floor covering.

D. Broom Finish: Exterior horizontal surfaces not scheduled for nonslip finish and interior surfaces scheduled to receive thin set tile.

END OF SECTION

SECTION 04 20 00
UNIT STRUCTURAL MASONRY

PART 1 GENERAL

1.1 WORK INCLUDED

A. Includes furnishing all materials, equipment and services as required in conjunction with or properly incidental to construction of all masonry as described and/or as shown on the Drawings.

B. Comply with Drawings and general Requirements and Referenced Documents.

1.2 CODES AND STANDARDS

A. Concrete masonry unit manufacturer shall certify that masonry units furnished meet or exceed requirements of this Specification.

B. The work in this Section, unless noted on the Drawings, or herein specified shall be governed by the latest edition of the following codes or specifications.

1. ACI 531 "Building Code Requirements for Concrete Masonry Structures."

2. ASTM C-145 "Standard Specification for Solid Load Bearing Concrete Masonry Units."

3. ASTM C-270 "Standard Specification for Mortar for Unit Masonry."

1.3 SUBMITTALS

A. Submit shop drawings showing dimensions necessary for fabrication and placement of reinforcement and accessories.

B. Do not make shop drawings using reproductions of Contract Drawings.

C. Submit in writing any requests for modification to Drawings or Specifications. Submitting shop drawings for review does not constitute "in writing" unless it is brought to the attention of the Architect that specific changes are being suggested.

1.4 STORAGE OF MATERIALS

A. Deliver materials to job site in undamaged condition.

B. Store concrete masonry units on raised platforms. Cover and protect units from inclement weather.

C. Store mortar and grout materials in manner to prevent intrusion of moisture and contaminants.

1.5 JOB CONDITIONS

A. Masonry construction shall be in compliance with "Recommended Practices and Specifications for Cold weather Masonry Construction" adopted February 1975 by International Masonry Industry All-Weather Council and as specified herein.

B. Lay no concrete masonry unit when air temperature is below 40 degrees F unless materials are protected from weather and laid up in shelter. In such instances, maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.

C. In temperatures exceeding 100 degrees F, do not lay out mortar beds ahead of placing units. Use a very light fog spray, not sufficient to penetrate masonry, on vertical surface of masonry to aid in mortar curing during first 24 hours after placing units.

PART 2 PRODUCTS

2.1 MATERIALS

A. Concrete Block:

1. Hollow load-bearing units:

a. ASTM C 90, Grade N general purpose, Type I moisture-controlled. Units shall have a compressive strength of 2,000 psi on net area.

b. Nominal face dimensions: 8" high x 16" long.

c. Provide standard and fire rated units.

2. Provide normal weight aggregate units.

3. Masonry Units shall be manufactured by Feather Lite Building Products, P.O. Box 1029, Austin, Texas 7876, 512/472-2424.

4. Special shapes:

a. 8" Smooth and Split Face Block Hollow Core Units.

b. 12" Smooth and Split Face Block Hollow Core Units.

B. Flashing

1. 20-mil minimum thickness elastomeric impermeable sheet material.

2. Resistant to corrosive effects of masonry mortar.

3. Acceptable product: Nervastral HD, Rubber and Plastics Compound Co., Inc.

C. Horizontal Joint Reinforcing:

1. Continuous open-web welded wire trusses, 9 ga. side rods and diagonal ties, galvanized finish, welded at 16" intervals to continuous side rods forming truss design.

2. Prefabricated corner and "tee" intersecting units.

3. Size for single wythe construction.

4. Acceptable products:

a. Dur-O-Wal, Dur-O-Wal Company.

b. Blok-Trus, AA Wire Products Company.

c. Trus-Mesh, Hohmann and Barnard.

D. Reinforcing Rods: ASTM A 615, Grade 60.

E. Weeps: PVC plastic tubes or sash cord.

F. Portland Cement:

1. ASTM C 150, Type I or Type III, nonstaining.

2. Use of masonry cement will not be permitted.

G. Hydrated Lime: ASTM C 207, Type S.

H. Mortar Aggregates:

1. ASTM C 144, free of clay or organic matter.

2. Gradation:

Sieve Size:	Percent Passing:
No. 4	100
No. 8	95 to 100
No. 16	60 to 100
No. 30	35 to 70
No. 50	15 to 35
No. 100	2 to 15
No. 200	0 to 2

I. Portland Cement Grout Aggregates: ASTM C 33, pea gravel uniformly graded from 3/8" to 1/2".

J. Water: Clean and free of deleterious amounts of acids, alkalies or organic matter.

K. Cleaning Agents:

1. Combination of surface acting acids and wetting agent for general purpose cleaning of new masonry surfaces.

2. Acceptable product: Sure-Klean No. 600 Detergent, Pro/So/Co., Inc.

2.2 MIXES

A. Mortar Proportions:

1. Nonload-bearing walls: ASTM C 270, Type N, 750 psi at 28 days, (1:1:6).

2. Load-bearing walls: ASTM C 270, Type S, 1800 psi at 28 days, (1:1/2:4-1/2).

B. Portland Cement Grout: Portland cement, sand, pea gravel and water proportioned to produce 2,500 psi at 28 days with 9-1/2" slump when placed.

C. Control batching procedure to ensure proper proportions by measuring materials by volume. Measurement by shovel will not be permitted.

D. Mix mortar in accordance with requirements of BIA M 1 and grout in accordance with ASTM C 476.

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect foundation to assure surfaces to support masonry are to proper grade and elevation and free from dirt or other deleterious matter.

3.2 PREPARATION

A. Concrete Masonry Units:

1. Lay only dry units, free of paint, oil, efflorescence or foreign matter.

2. Remove laitance, loose aggregate or anything that prevents bonding to foundation.

B. Reinforcement: Before being placed, remove loose coatings from reinforcement.

C. Use masonry saws to cut masonry units.

3.3 INSTALLATION

A. Installation Tolerances:

1. Maximum Variation from Plumb:

a. Vertical lines and surfaces of columns and walls:

(1) 1/4" in 10'-0".

(2) 3/8" in 20'-0" maximum.

(3) 1/2" in maximum.

b. External corners or control joints:

(1) 1/4" in 20'-0"

(2) 1/2" in 40'-0" maximum.

2. Maximum Variation from Level or Grades for Exposed Lintels, Sill, Parapets or Horizontal Grooves:

a. 1/4" on any bay or 20'-0".

b. 1/2" in 40'-0".

3. Maximum Variation from Plan Location of Linear Building Line or Related Portions of Columns, Walls and Partitions:

a. 1/2" in any bay or 20'-0".

b. 3/4" in 40'-0".

4. Maximum Variation in Cross-Sectional Dimensions of Columns and Thickness of Walls: -1/4"; +1/2".

B. Pattern Bond: Running bond with vertical joints located at centerline of masonry units in alternate courses unless noted otherwise on architectural drawings.

C. General:

1. Set units plumb, true to lien and with level courses accurately spaced within allowable tolerances.

2. Do not install cracked, broken or chipped masonry units exceeding ASTM allowables.

3. Adjust masonry unit to final position while mortar is soft and plastic.

4. Where adjustment must be made or if units are displaced after mortar has stiffened, remove units, clean joints and units of mortar and relay with fresh mortar.

5. Do not pound corners and jambs to fit stretcher units after they are set in position.

6. Adjust shelf angles to keep masonry level and at proper elevation.

7. Provide pressure relieving joints by placing continuous 1/8" foam pad under shelf angle.

D. Mortar Beds:

1. Hollow units:

a. Lay with full mortar coverage on horizontal and vertical face shells.

b. Provide full mortar coverage on horizontal and vertical face shells and webs where adjacent to cells or cavities to be filled with grout.

E. Horizontal and Vertical Face Joints:

1. Construct uniform joints, 3/8" nominal thickness.

2. Shove vertical joints tight.

3. Tool concave joints in exposed surfaces when thumb-print hard with round joints slightly larger than width of joint.

4. Flush cut all joints not exposed.

5. Fill horizontal joints between top of non-load bearing masonry partitions and underside of beams or slabs with flexible material.

F. Control Joints:

1. Keep clean of mortar and debris.

2. Install where indicated and at following locations:

a. Changes in thickness, height and direction.

b. Within 8'-0" of corners or offsets.

c. At control or expansion joints in structure.

d. At each side of openings greater than 24" wide.

e. Place control joints at foundation walls, shelf angles, setbacks and materials expanding at different ratios.

3. Concrete masonry units:

a. Space joints at 30'-0" o.c. maximum in uninterrupted walls.

b. Provide continuous vertical control joints through bond beams except at

lintels above openings

c. Offset control joints to ends of lintels.

G. Collar Joints:

1. Keep cavity in cavity walls clean.

2. Remove all protruding mortar fins in cavity to be grouted.

H. Joining of Work:

1. When joining fresh masonry to set or partially set masonry construction, remove loose units and mortar and clean exposed surface of set masonry prior to laying fresh masonry.

2. If necessary to stop off horizontal run of masonry, rack back one-half block length in each course.

3. Do not use toothing to join new masonry to set or partially set masonry.

I. Reinforcing and Ties:

1. Bars:

a. Reinforce each jamb of wall openings with one bar vertical.

b. Place reinforcing bars in hollow cores vertically where indicated.

2. Horizontal joint reinforcing:

a. Fully embed joint truss type reinforcement in each alternate bed joint 16" o.c.

b. Extend joint reinforcement entire length of bed joint.

c. Place reinforcing in course immediately above opening extending at least 16" past each side of opening.

d. Lap reinforcement minimum 6" at ends.

e. Bend or weld at offsets or special conditions.

J. Bond Beams:

1. Provide CMU bond beams at top of CMU walls and lintels above openings.

2. Reinforce bond beams with minimum of two bars and grout.

3. Discontinue bond beams at expansion and control joints.

K. Flashing:

1. General:

a. Clean surface to receive flashing and remove projections which might puncture or damage flashing material.

b. Seal joints with manufacturer's recommended adhesive.

c. Seal top of flashing to ensure moisture cannot infiltrate behind flashing.

d. Continue flashing around corners. Ensure membrane material is not interrupted in horizontal plane at corners.

2. Wall base, opening sills and heads:

a. Place flashing on mortar bed and cover with mortar.

b. Start 1/2" from outside face of wall and turn up in cavity 8" minimum.

c. Lap joints 4" minimum.

d. Place flashing under and behind sills.

e. Place flashing over steel lintels.

f. Extend flashing beyond opening jamb lines.

L. Weep Holes:

1. Provide weep holes in head joints in first course immediately above flashing by either leaving head joint free and clean of mortar or placing and leaving sash cord or plastic weeps in joint.

2. 24" o.c. maximum spacing.

3. Keep weep holes and area above flashing free of mortar waste.

M. Built-In Work:

1. At completion of conventional masonry unit work, fill holes in joints and tool.

2. Cut out and re-point defective joints.

3. Dry brush masonry surface after mortar has set at end of each day's work and after final pointing.

3.4 CLEANING

A. Clean initially with stiff brushes and water. Remove efflorescence in accordance with manufacturer's recommendations.

B. When cleaning agent is required, apply cleaning agent to sample wall area of 20 sq. ft.

1. Do not proceed with cleaning until sample area is reviewed.

2. Scrub with acceptable cleaning agent and immediately rinse with clear water.

3. Do small sections at a time, working from top to bottom.

4. Protect sash, metal lintels and other corrosive parts when masonry is cleaned with acid solution.

C. Leave area and surfaces clean and free of mortar spots, drippings and broken masonry.

END OF SECTION

SECTION 05 50 00
MISCELLANEOUS METAL WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Furnish all labor, materials, equipment, apparatus, tools, transportation, protection, and services necessary for Miscellaneous Metal Work indicated on the Drawings and specified herein.

B. Examination: Carefully examine the Drawings and Specifications and include all Miscellaneous Metal Work not distinctly specified in other sections, or noted on the Drawings as being provided by other Trades.

C. Miscellaneous Metal Products: No attempt is made to enumerate or describe each item of the Work, but simply to describe major items, certain special items, and general construction requirements for all items. Work includes, but is not necessarily limited to the following:

1. Anchors.

2. Anchor Bolts and Pipe Sleeves.

3. Lintels.

4. Miscellaneous Steel Frames and Curbs.

5. Steel Ladders - furnish and install.

D. Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Concrete Reinforcing - Sections 03 200 and 03 30 00.

2. Reinforced Unit Masonry Assemblies - Section 04820.

3. Structural Steel (including Roof Opening Curb Steel) - Section 05120.

4. Steel Roof Deck - Section 05312.

5. Cold-Formed Metal Framing - Section 05 40 00.

6. Rough Carpentry - Section 06 10 00.

7. Roof and Wall Specialties and Accessories - Section 07 70 00.

8. Hollow Metal Doors and Frames - Section 08 11 13.

9. Door Hardware - Section 08 71 00.

10. Gypsum Wallboard - Section 09 29 00.

11. Acoustical Panel Ceilings - Section 09 51 13.

12. Paints and Coatings - Section 09 90 01.

E. Work Furnished but not installed:

1. Items anchored (not bolted) to Concrete and Masonry Work.

2. Items as specified herein for installation by others.

1.02 DESIGN REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements for ASTM Standard E985 for structural performance, based on testing performed in accordance with ASTM Standards E894 and E935.

B. Accessibility Guidelines: Handrails required to be accessible to persons with disabilities shall comply with Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

A. Reference Specifications: Except as otherwise specified herein, materials and workmanship shall conform to the following current specifications as amended to date.

1. All applicable Local Building Codes and Ordinances.

2. “Specifications for Structural Steel Buildings”, and “Commentary” thereon, as adopted by the American Institute of Steel Construction, Inc. (AISC), March 9, 2005.

3. American Welding Society (AWS), D1.1, Structural Welding Code - Steel.

4. “Standard Specifications for Open Web Steel Joists” as adopted by the Steel Joist Institute (SJI) and the American Institute of Steel Construction, Inc., (AISC).

1.04 CERTIFICATION OF WELDERS

A. Current and valid certification qualified by a recognized, Independent Laboratory shall be furnished to Architect for all welders working on fabrication and/or erection PRIOR to starting Work. All welding shall be performed by welders who have qualified by tests in accordance with AWS “Standard Qualification Procedure”, to perform the type of Work required.

1.05 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

C. Shop Drawings:

1. Prepare completely detailed Shop Drawings showing all items to be provided, and submit reproducibles to the Architect for review.

2. Prepare completely detailed Shop Drawings showing details for cutting, fabricating, and connecting all pieces. Do not duplicate Design Drawings for use as Shop Drawings. Duplication of Design Drawings shall be grounds for rejection.

3. Where connections are not shown on the Drawings, connections shall be designed and detailed on the Shop Drawings, and sealed by a Registered Professional Structural Engineer in the State of the proposed Project, retained and paid by the steel fabricator.

4. Provide separate Shop Drawings for erection.

5. Prepare Shop Drawings in accordance with “AISC - Detailing for Structural Steel”, latest edition, using a marking system compatible with, and referenced to, the marking system used on the Design Drawings.

6. Indicate welding by using AWS symbols, showing type, size and location of all welds. Provide auxiliary views of welds as required to clarify the welded connections.

7. Formally check all Shop Drawings before forwarding to Architect.

C. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

1.06 QUALITY CONTROL

A. Testing Agency Services: Contractor may engage at his expense, a separate testing agency for information and guidance, to ascertain that all new materials are furnished, fabricated and installed in accordance with all requirements of the Contract Documents. The testing agency shall send reports of all inspections to the Architect, Owner, and General Contractor.

1.07 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 Substitution

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MATERIALS

A. Steel Rolled Plates and Shapes: Fabricated from new open hearth structural steel conforming to ASTM A36 - Standard Specification for Carbon Structural Steel.

B. Steel Pipe: ASTM Standard A53, Type S, Grade A, Schedule 40, unless otherwise noted.

C. Steel Tubing: Cold rolled, electric resistance welded, carbon steel, hollow, structural steel tubing, fabricated from steel having properties complying with ASTM A500 - Standard Specification for Cold- Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

D. Hi-Tensile Bolts: Heavy hex type structural bolts conforming with ASTM Standard A325, with matching heavy hex type nuts, 3/4" minimum diameter, of lengths required for connections, with hardened steel washers.

E. Standard Bolts and Anchor Bolts: Unfinished bolts conforming to ASTM Standard A307, Grade A, with hexagon heads and nuts where exposed in the finish Work.

F. Expansion Bolts: Hilti® Kwik Bolt 3 Expansion Anchor as manufactured by Hilti, Inc., 5400 South 122nd. East Avenue, Tulsa, OK 74146, (866)445-8827, (800)879-8000 or (918)252-6000; www.us.hilti.com.

1. Comparable Products: Expansion bolts by the following manufacturer with comparable products of equivalent capacity may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review.

a. Power-StudÔ as manufactured by Powers Fasteners, Inc., 2 Powers Lane, Brewster, NY 10509, (800)524-3244 or (914)235-6300; www.powers.com.

G. Welding Electrodes: Series E-60 or E-70, AWS A5.1 or A5.5.

H. Galvanizing: Provide zinc coating where indicated on the Drawings. Galvanizing shall be in accordance with ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products and/or ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, not less than 1.25 oz./sq. ft.

I. Priming Paints: Provide one (1) of the following manufacturers and products, "lead and zinc chromate free" rust inhibiting priming paint, subject to review by the Architect. Substitutions will not be permitted.

1. Manufacturers:

a. ICI Paints, Devoe® High Performance Coatings, Strongsville, OH, (800)654-2616; www.devoecoatings.com.

b. PPG Architectural Finishes, 400 S. 13th Street, Louisville, KY 40203, (800)441-9695; www.ppghpc.com.

c. Tnemec, Inc., 6800 Corporate Drive, Kansas City, MO 64120, (800)863-6321; www.tnemec.com.

2. Ferrous Metal Paint Product:

   a. ICI Paints, Devoe® High Performance Coatings, DEVSHIELD™ 4130 Rust Penetrating Metal Primer, Light Gray.

   b. PPG Architectural Finishes, PPG High Performance Coatings™ (HPC), SPEEDHIDE® Int/Ext Rust Inhibitive Steel Primer 6-208 Red.

   c. Tnemec, Inc., Tnemec Primer Series 10, 99 Red.

3. Galvanized Steel Paint Product:

   a. ICI Paints, Devoe® High Performance Coatings, DEVGUARD™ 4160 Multi-Purpose Tank & Structural Primer, White.

   b. PPG Architectural Finishes, PPG High Performance Coatings™ (HPC), SPEEDHIDE® Int/Ext Galvanized Steel Primer 6-209, White.

   c. Tnemec, Inc., Hi-Build Epoxoline Series 66, White.

2.02 CONNECTIONS AND WORKMANSHIP

A. General: Weld all shop connections, bolt or weld all field connections unless otherwise noted or specified. Provide all clips, lugs, brackets, straps, plates, bolts, nuts, washers, required for complete fabrication and erection. Use connections of type and design required by forces to be resisted, and to provide secure fastening. Shop welded steel bolts shall be welded to sides and bottom of steel members, not at top of member.

B. Bolting: In bolting, draw-up bolts or nuts tight, and deform threads where possible. Use bolts of lengths required so that bolts do not project more than 1/4" beyond face of nut. Do not use washers unless specified.

C. Welding:

1. Perform all welding by the electric arc method, in accordance with the recommendations of the American Welding Society (AWS). Welds shall be solid and homogeneously a part of the metals joined, free from pits or incorporated slag or scale. Surfaces of weld shall be smooth and regular, and shall be of full area indicated or required to develop the required strength of the joint.

2. Only welders and welding operators who have been tested and certified in accordance with Appendix A, AWS D1.0, and the applicable provisions of AWS D1.0 will be permitted. All operators shall pass all applicable qualification tests

while in the current and continuous employment of the fabricator or erector regardless of previous qualifications and certifications.

3. Perform all shop and field welding by the shielded metal-electric arc process. Use qualified welders. Provide all necessary jigs and holding devices for shop welding. Dog or clamp down all Work to prevent distortion during welding.

4. Design weld details and procedures so as much shop Work as possible is performed in the flat and horizontal position. Avoid undercutting, insufficient throat or leg, lack of fusion and splattering. Prepare welding procedure specifications and diagrams for each weld joint, and use in the Work. Assign each joint a procedure designation number or code. Show the number or code in the tail or each welding symbol in the Shop Drawings. Qualify non-prequalified welds in accordance with Appendix A, AWS D1.0. Where a standard weld type is repeated throughout the Work, the procedure designation or code may be indicated by general note or reference on each Shop Drawing where that weld type appears.

5. Make fillet welds larger than 5/16" in not less than two (2) passes. After each pass, remove the slag coating entirely before starting next pass. Do not use fillet welds smaller than 1/4" unless the thickness of the connected material requires the use of 3/16" weld. Add approximately 3/4" to the theoretical length of all intermittent welds as an allowance for craters. Fill all craters.

6. Structural welds shall not be less than 3" in length unless otherwise approved on Shop Drawings.

7. Welds of all metal fabrications exposed in the finish Work shall be ground smooth, flush with adjacent surfaces, filleted at angular connections, and suitably prepared for final finish painting, unless otherwise specified.

D. Galvanized Steel Products: Field touch-up all damaged areas of galvanized coating, damaged during erection including field abrasions and welds, with zinc-rich galvanized coating repair paint according to ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Provide nylon/polyester or natural bristle brush application of paint product in accordance with the manufacturer’s recommendations and instructions. Surfaces shall be dry, free from oil, dirt, dust, mill scale or other contaminants to ensure adequate adhesion.

1. Galvanized Coating Repair Paint: Zinc Clad® VI Water Based Organic Zinc-Rich Epoxy (VOC content of less than 105 grams/liter), as manufactured by The Sherwin-Williams® Company, Cleveland, OH, (800)321-8194; www.sherwin-williams.com

2. Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

E. Holes for Connections of Work by Others: Provide all holes required for the connection of the Work of other Trades where noted on the Drawings, or determined prior to fabrication of the steel.

F. Finished Work: Any Work not presenting a finished appearance will be rejected. Furnish all members true to length so assembling may be done without fillers, except where required as detailed. Trim projecting edges or corners flush where different members are assembled. All items shall be free from twists, bends, and joints. Cope, block, and miter joints carefully and neatly. Clip projecting corners. Trim all filler pieces flush.

2.03 PAINTING (SHOP AND FIELD)

A. Miscellaneous (steel) metal shall be shop prime painted and field touched-up using paint specified herein.

B. Before shop painting, thoroughly clean all surfaces of all dirt, grease, scale and rust. All surfaces not in contact but inaccessible after assembling shall have two (2) coats before assembling. Surfaces in contact after assembling need have no paint. All finished pieces shall have one (1) coat before leaving the shop.

C. After erection, clean all foreign material off the steel, and if paint is removed, repaint to meet requirements of original prime coatings.

D. After all miscellaneous (steel) metal Work has been installed and accepted, touch-up all abraded surfaces, including field bolts and welded areas.

1. Volatile Organic Compounds (VOC) Content: Field touch-up paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

E. Furnish the General Contractor with copies of invoice for paint, and allow manufacturer’s representatives and General Contractor full access to the paint shop to inspect the paint.

2.04 ANCHORS

A. Provide anchors for miscellaneous iron members anchored into concrete or masonry. Fabricate anchors from strap iron, bent to shape, welded to backs of members, extended with bent end for building-in as conditions require, of sizes and spacing as noted. Where size and spacing are not noted, furnish 1-1/2" x 1/4" size anchors for concrete and 1-1/2" x 1/8" size anchors for masonry. Space masonry anchors properly to fit the pointing of the

adjacent masonry Work. Unless otherwise noted on the Drawings, space anchors 3'-0" or less on centers.

B. Where anchors and plates or clips are to be built-in for attachment of later Work, provide bolts in the plates or clips, welded to back, with threaded ends extended as required.

C. For attaching Work to masonry or concrete, where anchors or inserts cannot be built-in, provide approved type of cinch anchors and machine bolts or screws.

2.05 ANCHOR BOLTS AND PIPE SLEEVES

A. Furnish to Masonry Contractor for installation, miscellaneous anchor bolts and pipe sleeves as indicated and required, including all markings, setting diagrams, templates. Steel Contractor shall drill all holes required for anchor bolts and through-bolts detailed not to be built-in.

B. Furnish to Concrete Contractor for installation, pipe sleeves as indicated and required, including all markings, setting diagrams, and templates.

2.06 LINTELS

A. Furnish to the Masonry Contractor for setting, all steel lintels for masonry veneers, including those required for items such as grilles, doors, ducts, wall recesses and other locations shown or required.

B. Lintels shall be rolled structural shapes of sizes noted, selected for straightness and trueness of section. Camber shall not exceed 1/8" in 10'-0".

C. Unless otherwise shown, lintels shall have a bearing of not less than 8" each side of opening.

D. Galvanize all lintels in exterior walls.

2.07 MISCELLANEOUS STEEL FRAMES AND CURBS

A. General: Furnish steel frames and curbs in accordance with the Drawings and as specified herein, to Masonry or Concrete Contractor for setting.

B. Fabrication: Steel frames for door and other miscellaneous openings, and steel curbs throughout shall be built-up of rolled steel plate or structural sections as noted, with connections to adjoining Work, and anchors for building into masonry and/or concrete. All sections shall be selected for trueness of web and flange, straightened as required so that the finished frames are uniform, square and true throughout the length and depth of the assembled units and that curbs are straight and true.

C. Assembly: Frames shall be assembled by riveting or welding, but rivets may not be used on exposed surfaces. Built-up members of frames shall be connected by means of plug welding or continuous welding. Exposed edges of member shall be welded continuously. Frames and lintel members shall be welded together where so noted and shown. All exposed welding shall be ground smooth.

D. Door Frame Jambs in Concrete or Masonry: Provide 1-1/4" x 3/16" steel strap anchors on back, vertically adjusted, 2'-0" on centers maximum for building into concrete or masonry, and clip angle at bottom for bolting into concrete; and shall be fitted with temporary spreader bars at bottom to hold frame in shape during shipping and erection.

E. Steel Frames and Curbs in Concrete Work: Provide 1-1/2" x 1/4" steel strap anchors on back, extended for building-in, spaced not over 3 ft. on centers, but not less than two (2) per side.

2.08 STEEL LADDERS

A. General: Interior steel ladders shall be Occupational Safety and Health Administration (OSHA) approved ladders complete as detailed on Drawings. Fabricate steel ladders, as detailed with parallel side rails, of structural steel shapes indicated, and 3/4" diameter, solid, cold-rolled steel bar stock rungs spaced as shown on Drawings. Drill side rails for rungs, set rungs into rails, weld rungs solidly into rails, and grind rails smooth. Provide all steel plate brackets, washers, and fasteners, including steel angle braces, as required and detailed to install ladders in place securely.

2.09 MISCELLANEOUS

A. Anchoring Cements: Products specified herein shall be as manufactured by CGM, Incorporated, 1445 Ford Road, Bensalem, PA 19020, (800)523-6570, (215)638-4400; www.cgmbuildingproducts.com, or comparable equivalent products subject to review by the Architect.

1. Exterior Use - Anchoring Cement: Super Por-Rok® Exterior Anchoring Cement, quality controlled hydraulic cement, quick-setting, pourable, non-metallic, non-shrink grout, in accordance with the following ASTM International Standard Specifications.

a. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

b. ASTM C900 - Standard Test Method for Pullout Strength of Hardened Concrete.

2. Interior Use - Anchoring Cement: Por-Rok® Anchoring Cement, non-shrink, hydraulic controlled expansion cement.

3. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

B. Isolation Coatings: Paint products specified herein shall be as manufactured by The Sherwin Williams® Company, Cleveland, OH, (800)321-8194, (800)474-3794, or comparable manufacturer's equivalent products subject to review by the Architect.

1. Aluminum Contact with Steel: Wherever aluminum items are to be secured to, or in contact with steel supporting members, paint the contact surface of the steel with the following paint system for both the surfaces of the steel supporting members and the aluminum.

   a. One (1) Prime Coat: Kem Kromik® Universal Metal Primer, B50WZ1 Off-White (VOC content of less than 420 grams/liter).

      1) Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

   b. One (1) Topcoat: TarGuard® Coal Tar Epoxy, B69B60 Black (VOC content of less than 250 grams/liter).

      1) Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Aluminum Contact with Masonry or Concrete: Wherever aluminum items are to be secured to or in contact with masonry or concrete, shop paint the aluminum contact surface with the following paint product.

   a. One (1) Topcoat: TarGuard® Coal Tar Epoxy, B69B60 Black (VOC content of less than 250 grams/liter).

      1) Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

3. Brass or Bronze Contact With Steel: Wherever brass or bronze items are to be in contact with steel members, paint the contact surfaces of the steel with one (1) coat of TarGuard® Coal Tar Epoxy, B69B60 Black, (VOC content of less than 250 grams/liter).

a. Volatile Organic Compounds (VOC) Content: Galvanized coating repair paint product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

4. Condition of Painted Products: Paint coats shall be thoroughly dry prior to installation of the steel, aluminum, brass and/or bronze products. Exposed to view surfaces shall be clean and free of isolation coatings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 SETTING AND ERECTING MISCELLANEOUS METAL

A. Fabricate all items as required to be built into concrete or masonry completely, and deliver to site for installation by others. Furnish all parts complete with bolts, anchors, and clips, ready to set. Deliver items to the general location of the Work. Where Work is composed of several parts, only those parts, upon which anchors occur, will be set and built-in by the other Trades, ready to receive further field assembly by this Trade.

1. All Work required to be anchored entirely in concrete shall be set by the Concrete Contractor.

2. All Work required to be anchored entirely to masonry shall be set by the Mason Contractor.

3. All Work required to be anchored partially to masonry shall be set by the Mason Contractor.

B. Where necessary to secure Work to the structure by means of expansion bolts, cinch anchors, and similar connections, lay-out and install connections, install the Work and bolt up. Drill holes in Concrete and Masonry Work with rotary twist drills only.

C. Furnish, connect, and completely install all other items. Erect all items to proper lines and levels, plumb and true, and in correct relation to adjoining Work. Secure all parts in a rigid and substantial manner using concealed connections whenever practicable.

3.03 FIRE PREVENTION

A. Precautions: When welding or cutting with burning torches is required, take all precautions to prevent damage to the building(s) from fire, weld spatter, dripping molten metal, smoke and fumes, or other causes arising from the operations. Provide fireproof tarpaulins or enclosures around the areas of welding or burning.

B. Trained Personnel and Equipment: Furnish a worker trained and experienced in fire-fighting, whose sole duty shall be to prevent damage and fire at each location where welding or burning is to be done. Furnish adequate and sufficient fire-fighting equipment and extinguishers at each location.

3.04 FIELD FINISH PAINTING

A. Finish field painting of miscellaneous metal items as indicated on the Drawings and specified herein shall be by the Painting Contractor.

3.05 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Furnish all labor, materials, equipment, and services necessary for Rough Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Wood Nailers, Blocking, and Plywood - furnish and install.

2. Rough Hardware - furnish and install.

B. Related Sections: The following items of related Work will be performed under other sections of the Specifications:

1. Indoor Air Quality Requirements - Section 01 81 19. AIR BORNE PRODUCTS

2. Concrete Formwork and Cast-In-Place Concrete- Sections 03 10 0 and 03 30 00.

3. Unit Structural Masonry - Section 04 23 0.

4. Structural Steel - Section 05 12 00.

5. Metal Roof Deck - Section 05 31 0.

6. Cold-Formed Metal Framing - Section 05 40 00.

7. Board Insulation - Section 07 21 2.

8. Sheet Metal Work - Section 07 60 00.

9. Aluminum Framed Entrances and Storefronts- Section 08 41 13.

10. Gypsum Wallboard - Section 09 29 00.

11. Thin-Set Tile Work - Section 09 31 00.

12. Resilient Tile Flooring - Section 09 65 19

13. Paints and Coatings - Sections 09 90 00.

14. Toilet Compartments - Section 10 21 13.

15. Plumbing Fixtures - Division 22.

1.02 QUALITY ASSURANCE

A. Wood Treatment Plants: The treatment plant shall be franchised or licensed by the specified preservative and/or retardant manufacturers as specified herein.

B. Requirements of Regulatory Agencies:

1. Grades of Lumber and Plywood: Lumber and plywood shall be as defined by the rules of the recognized association of manufacturers producing the kind or species of lumber and plywood specified herein. All lumber and plywood shall be grade stamped by the inspecting authorities.

C. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

D. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.03 MEASUREMENTS

A. Field Measurements: Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together and to the building.

1.04 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

C. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products. Special attention shall be given to, but not necessarily limited to the following:

D. Product Data: Include the following for review.

1. Wood Treatment Certificates for Lumber and Plywood.

2. Products specified herein under Article heading MISCELLANEOUS".

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by wood and plywood.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 WOOD FOR ROUGH CARPENTRY

A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

B. Lumber: Wood shall conform to American Softwood Lumber Standard, current edition of "Voluntary Product Standard PS20", as published by the National Institute for Standards and Technology (NIST). Grades shall conform with current grading rules of the Lumber Manufacturers Association, under whose rules the lumber is manufactured.

C. Dimension and Board Lumber: Douglas Fir. All lumber shall be "seasoned dry" (S-DRY), 19% or less moisture content.

D. Lumber Grades:

1. Boards: Douglas Fir, S4S, Standard Grade or better.

E. Wood Treatments: All dimension lumber except wood blocking and nailers at roof, shall be fire retardant treated. Wood blocking and nailers at roof and in contact with masonry shall be preservative treated.

2.02 PLYWOOD

A. Standards, Thicknesses and Grades: Plywood shall be in accordance with the National Institute of Standards and Technology (NIST) current DOC VPS Standard PS 1-95, and the quality standards of the APA-The Engineered Wood Association (formerly American Plywood Association). Thicknesses shall be as indicated on the Drawings. Grades of plywood shall be as follows for various uses, as indicated by the registered grade-trademarks of APA:

1. Plywood Sheathing: C-D EXT-APA or APA Standard with exterior glue.

2. A-C Plywood: A-C EXT-APA.

3. A-D Plywood: A-D Exposure 1 (interior exposed, such as backboards for electrical and telephone panels).

4. B-C Plywood: B-C EXT-APA (water heater platforms).

5. C-D Plywood: C-D Plugged (interior concealed).

B. Engineered Wood Products: Products shall contain no urea formaldehyde.

C. Fire Retardant Treatment: All plywood and plywood sheathing shall receive “Fire Retardant Treatment” as specified herein.

2.03 WOOD TREATMENTS

A. Manufacturer: Wood treatments required and as specified herein shall be products Equal to: Arch Wood Protection, Inc., Arch Treatment Technologies, Inc., 5660 New Northside Drive, Suite 1100, Atlanta, GA 30328, (678)627-2000; www.archchemicals.com. Manufacturers with equivalent products and treatments shall be subject to review by the Architect.

B. Wood Preservative Treatment: All wood nailers at roof parapets, and/or in contact with masonry, and elsewhere as indicated on the Drawings, shall be pressure impregnated in accordance with the specifications for treatment by Arch Wood Protection, Inc., with Wolman® CCA (Chromated Copper Arsenate) wood preservative and shall bear the Wolmanized® trademark. Treated wood shall conform to AWPA Standard P5, and have a mark certifying conformance. The treating process shall meet requirements of Fed. Spec. TT-W-571 and AWPA Commodity Standards as applicable.

C. Fire Retardant Treatment: Fire retardant treat all wood lumber, plywood and plywood sheathing by pressure treating with Dricon® fire retardant chemicals, by Arch Wood Protection, Inc. Kiln dry all pieces after treatment. Identify all treated pieces with an Underwriters Laboratories, Inc., label or marking, prior to shipment to site. Treatment shall be in accordance with the impregnating salt manufacturer's U.L. approved, specifications, and shall render the wood fire retardant to the extent that
the flame spread does not exceed 25 per ASTM Standard E84 modified to require a 30 minute test period. The treating process shall conform to the requirements of the applicable AWPA Standard C1, C2, C3, C4, C9, C14, C15, C16, C22, C23, C24, C28, C31, C33 and M4, for the species, product, preservative and end use. Preservatives shall conform to AWPA P1/P13, P2, P5, P8 and P9. Include certification by treatment plant that the treatment will not bleed through finished surfaces.

D. Certification: Submit certificates of wood treatments. Stamp or brand lumber before delivery, indicating treatment applied.

E. Exposed Wood/Field-Cuts: Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative or fire-retardant treatment used in treatment.

1. Volatile Organic Compounds (VOC) Content: Field applied preservative and fire-retardant product specified herein shall have a VOC content of 350 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2.04 ROUGH HARDWARE

A. General: Furnish all items of rough hardware such as spikes, nails, screws, bolts, anchors, brackets, etc., necessary for the installation of this Work.

B. Bolts, Nuts, and Expansion Shields: Use galvanized steel bolts for all bolting Work. Use carriage bolts and nuts, or welded stud bolts and nuts for securing wood members to steel framing. Use metallic expansion shields for securing bolts to concrete. Use similar shields or toggle bolts for securing to masonry. Select length of bolts to suit thickness of material being joined.

C. Nails: Use nails conforming with Federal Spec. FF-N-105a, except as otherwise specified. Use galvanized steel nails for all Work. Zinc coating on galvanized nails shall conform with Article 3.2.1 of the Fed. Spec. Do not use aluminum nails. Except as otherwise specified, use common nails for securing of rough carpentry, use casing or finish nails, counter-set, for securing of finish carpentry.

D. Corrosion Rates: Rough hardware in contact with fire retardant treated wood shall exhibit corrosion rates less than one mil per year when tested in accordance with Fed. Spec. MIL-L-19140E, Paragraph 4.6.5.2.

2.05 MISCELLANEOUS

A. Isolation Coatings: Paint product specified herein shall be as manufactured by The Sherwin Williams® Company, McAllen, TX, or comparable manufacturer's products subject to review by the Architect.

1. Paint Product: TarGuard™ Coal Tar Epoxy, B69B60 Black.

2. Condition of Painted Products: Paint coats shall be thoroughly dry prior to installation of the steel/metal products. Exposed to view surfaces shall be clean and free of isolation coatings.

3. Volatile Organic Compounds (VOC) Content: Field applied preservative and fire-retardant product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 - Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 ROUGH CARPENTRY

A. Wood Nailers, and Blocking:

1. Neatly and accurately fit together with all necessary bolts and spikes, all wood where indicated on Drawings, such as blocking, nailers, as required to make secure.

2. Where wood blocking is required in metal stud framed walls, e.g., for support of Tenant's or Owner's fixturing, securely fasten the wood blocking to the metal stud framing at positions required, as detailed and/or noted on the Drawings. Coordinate Work with Tenant's or Owner's Representative.

3. Where wood members are to be secured to masonry, secure with 1/2" bolts with 3" hooked ends, not less that two (2) to each block, continuous nailers shall be spaced approximately 32" O.C. Bore lumber for bolts and countersink for heads. Provide washers under all bolt heads and nuts. All nailers and cants shall be furnished in long lengths to minimize number of end joints. When joints are required, they shall be made without projecting edges.

4. Miscellaneous wood items which are built into concrete or masonry shall be delivered to the respective contractors for installation.

5. Metal roof deck flutes shall be provided with wood blocking where and as indicated on the Drawings.

B. Rough Hardware: Install all items of rough hardware as necessary for the execution of the Work.

C. Preservative Treated Wood: Install wood treated with approved preservative for wood nailers at roof parapets, and in contact with masonry. Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative as applied at the treatment plant.

D. Fire Retardant Treated Wood: Install wood that has been fire retardant treated, and in all wood blocking.

E. Plywood: Install plywood, including plywood sheathing, of thickness noted and where indicated on Drawings. All Work and nailing shall be in accordance with the recommendations of APA-The Engineered Wood Association, and with the governing code requirements.

3.03 CLEAN-UP

A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor’s expense.

B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 06 11 40
WOOD BLOCKING AND CURBING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes roof curbs, and perimeter nailers; blocking in roof openings; telephone and electrical panel back boards; and preservative treatment of wood.

B. Related Sections:

1. Section 05312: Metal roof decking to receive wood curbs.

1.2 REFERENCES

A. ALSC (American Lumber Standards Committee) - Softwood Lumber Standards.

B. APA/EWA (APA/Engineered Wood Association) - Certification.

C. AWPA (American Wood Preservers Association) C1 - All Timber Products Preservative Treatment by Pressure Process.

D. SPIB (Southern Pine Inspection Bureau) - Lumber Grading Rules.

1.3 SUBMITTALS

A. Section 01330 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit technical data on wood preservative and fire retardant treatment materials and provide application instructions where required.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with the following agencies:
1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA/EWA.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lumber Grading Rules: SPIB.

B. Miscellaneous Framing: Stress Group D, No. 2 or better grade 19 percent maximum moisture content after treatment, pressure preservative treat.

C. Plywood: APA/EWA Rated Sheathing, Grade C-D; Exposure Durability 1; unsanded.

2.2 ACCESSORIES

A. Fasteners and Anchors:
1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.3 FACTORY WOOD TREATMENT

A. Wood Preservative (Pressure Treatment): AWPA Treatment C1 using water borne preservative with 0.25 percent retainage.

PART 3 EXECUTION

3.1 FRAMING

A. Set members level and plumb, in correct position.

B. Place horizontal members, crown side up.

C. Construct curb members of solid wood sections.

D. Space framing and furring 16 inches oc.

E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

F. Coordinate curb installation with installation of decking and support of deck openings.

3.2 SHEATHING

A. Install telephone and electrical panel back boards with plywood sheathing material where required. Size the back board by 12 inches beyond size of electrical and telephone panel.

3.3 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment.

B. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.4 SCHEDULES

A. Roof Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

B. Telephone and Electrical Panel Boards: ¾ inch thick, square edges, site brush applied preservative treated.

C. Storefront Blocking and shim: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

END OF SECTION

SECTION 06 16 43
GYPSUM SHEATHING

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications

PART1 - GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced, moisture and mold-resistant gypsum sheathing.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Section 05 40 00 Cold-Formed Metal Framing.

2. Section 06 10 00 Rough Carpentry.

3. Section 09 21 16 Gypsum Board Assemblies.

1.02 REFERENCES

A. ASTM International (ASTM):

1. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.

2. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

5. ASTM C1280 Standard Specification for Application of Gypsum Sheathing.

6. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

7. ASTM D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers**.**

8. ASTM E72 Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

9. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

B. Gypsum Association (GA): GA-253 Application of Gypsum Sheathing.

1.03 QUALITY ASSURANCE

A. Environmental Requirements: Paint products shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC).

B. Environmental Requirements: Paint products such as touch-up field painting and isolation coatings shall comply with all applicable Federal and State Regulations on Volatile Organic Compounds (VOC). PAINT

1.04 SUBMITTALS

A. Product Data: Manufacturer’s specifications and installation instructions for each product specified.

1.05 WARRANTY

A. Provide products that offer twelve months of coverage against in-place exposure damage (delamination, deterioration and decay).

B. Manufacturer’s Warranty:

1. Five years against manufacturing defects.

2. Ten years against manufacturing defects when used as a substrate in architecturally specified EIFS.

1.06 MATERIAL DELIVERY, STORAGE & HANDLING

A. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART2 PRODUCTS

2.01 MANUFACTURERS

A. Georgia-Pacific Gypsum LLC:

1. Fiberglass-Mat-Faced Gypsum Sheathing, Type X for Fire-Rated Designs: DensGlass Fireguard Sheathing.

B. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MATERIALS

A. Fire-Rated Fiberglass-Mat Faced Gypsum Sheathing: ASTM C1177, Type X:

1. Thickness: 5/8 inch.

2. Width: 4 feet.

3. Length: [8 feet] [9 feet] [10 feet].

4. Weight: 2.5 lb/sq. ft.

5. Edges: Square.

6. Surfacing: Fiberglass mat on face, back, and long edges.

7. Racking Strength (Ultimate, not design value) (ASTM E72): Not less than 654 pounds per square foot, dry.

8. Flexural Strength, Parallel (ASTM C1177): 100 lbf, parallel.

9. Humidified Deflection (ASTM C1177): Not more than 1/8 inch.

10. Permeance (ASTM E96): Not more than 17 perms.

11. R-Value (ASTM C518): 0.67.

12. Mold Resistance (ASTM D3273): 10, in a test as manufactured.

13. Microbial Resistance (ASTM D6329, GREENGUARD 3-week protocol): Will not support microbial growth.

14. Acceptable Products:

a. 5/8 inch DensGlass Fireguard Sheathing, Georgia-Pacific Gypsum.

2.03 ACCESSORIES

A. Screws: ASTM C1002, corrosion resistant treated.

PART3 EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

C. Verification of Conditions:

1. Inspection: Verify that project conditions and substrates are acceptable, to the installer, to begin installation of work of this section.

3.02 INSTALLATION

A. General: In accordance with GA-253, ASTM C1280 and the manufacturer's recommendations.

1. Manufacturer's Recommendations:

a. Current "Product Catalog", Georgia-Pacific Gypsum.

3.03 PROTECTION

A. Protect gypsum board installations from damage and deterioration until date of Substantial Completion.

3.04 CLEAN-UP

A. Waste Management: Collect field-generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Furnish all labor, materials, equipment, and services necessary for Carpentry Work indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Counter Supports - furnish and install.

2. Hollow Metal Door and Frames - install.

3. Finish Hardware - install.

4. TV Wall Mount Bracket - install.

B. Color Selections: Refer to Color Legend on Drawings.

C. Door Schedule and Colors: Refer to the Drawings.

D. Related Sections: The following items of related Work will be performed under other sections of the Specifications:

1. Unit Structural Masonry - Section 04 23 0.

2. Rough Carpentry - Section 06 10 00.

3. Hollow Metal Doors and Frames - Section 08 11 13.

4. Aluminum Storefronts - Section 08 41 10.

5. Door Hardware - Section 08 71 00.

6. Gypsum Wallboard - Section 09 29 00.

7. Thin-set Tile Work - Section 09 31 00.

8. Paints and Coatings - Section 09 90 00.

9. Toilet Compartments - Section 10 21 13.

10. Signage - Section 10 14 00.

11. Toilet Accessories - Section 10 28 13.

12. Fire Protection Specialties - Section 10 44 00.

13. Plastic Laminate - Clad Countertops - Section 12 36 23.13.

14. Plumbing Fixtures - Division 22.

1.02 QUALITY ASSURANCE

A. Wood Treatment Plants: The treatment plant shall be franchised or licensed by the specified preservative and/or retardant manufacturers as specified herein.

B. Requirements of Regulatory Agencies:

1. Grades of Lumber and Plywood: Lumber and plywood shall be as defined by the rules of the recognized association of manufacturers producing the kind or species of lumber and plywood specified herein. All lumber and plywood shall be grade stamped by the inspecting authorities.

1.03 MEASUREMENTS

A. Field Measurements: Contractor shall obtain field measurements of adjoining Work as required to locate and fit the Work of this section. Contractor shall be responsible for the accurate fitting of materials together and to the building.

1.04 SUBMITTALS

A. Shop Drawings: Prepare complete Shop Drawings, showing dimensions, sections, details of materials, fabrication, and installation of materials and products. Special attention shall be given to, but not necessarily limited to the following:

1. Counter Supports.

B. Product Data: Include the following for review.

1. Wood Treatment Certificates for Lumber and Plywood.

2. Products specified herein under Article heading “MISCELLANEOUS”.

1.05 PRODUCT DELIVERY, HANDLING AND STORAGE

A. Protection: Protect all materials from the weather during transit and during storage at the site. Store materials above the ground, in sheds if possible. If outdoor storage is required, house materials under waterproof coverings. Do not deliver materials to the job site until required for installation. Take all precautions to avoid absorption of moisture by wood and plywood.

B. Finish Hardware: The Finish Hardware Contractor will furnish all finish hardware not included in other trades, and deliver to Carpenter for storage and installation. Carpentry Contractor shall be responsible for safekeeping, furnishing templates to proper contractors, proper installation, receiving shipments and delivery of keys for hardware.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

PART 2 - PRODUCTS

2.01 WOOD FOR FINISH CARPENTRY

A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

B. Lumber Grades: All lumber shall conform to, and be graded in accordance with American Lumber Standard PS-20.

1. Grading Authority Stamp: All lumber shall bear stamp of grading authority indicating compliance with specified species, grade and moisture content. Finish lumber shall be stamped on back or end where not exposed to view.

2. Dimension and Board Lumber: Douglas Fir or Pine. Maximum allowable moisture content shall be 12%.

a. Appearance Framing: 2" to 4" thick, 2" and wider shall be Douglas Fir, S4S, No. 1/Appearance.
b. Boards: 1" thick, 2" and wider shall be Douglas Fir or Pine, S4S, Superior or better.

C. Millwork and Trim: “Custom Grade” as defined in the Architectural Woodwork Quality Standards Guide Specifications, and Quality Certification Standards of the Architectural Woodwork Institute (AWI).

D. Wood Species: Unless otherwise noted on the Drawings, wood specie shall be as follows (Provide sample for approval):

1. Paint Grade Trim: Natural Birch or Poplar.

2. Stain Grade Trim: Red Oak.

3. Hardwood: Natural Birch or Poplar.

E. Engineered Wood Products: Products shall contain no urea formaldehyde.

2.02 WOOD TREATMENTS

A. Manufacturer: Wood treatments required and as specified herein shall be products Equal to: Arch Wood Protection, Inc., 1955 Lake Park Drive, Suite 100, Smyrna, GA 30080, (770) 801-6600 or (866) 873-3789. Manufacturers with equivalent products and treatments shall be subject to review by the Architect.

B. Wood Preservative Treatment: All wood nailers at roof parapets, and/or in contact with masonry, and elsewhere as indicated on the Drawings, shall be pressure impregnated in accordance with the specifications for treatment by Arch Wood Protection, Inc., with Wolman® CCA (Chromated Copper Arsenate) wood preservative and shall bear the Wolmanized® trademark. Treated wood shall conform to AWPA Standard P5, and have a mark certifying conformance. The treating process shall meet requirements of Fed. Spec. TT-W-571 and AWPA Commodity Standards as applicable.

C. Fire Retardant Treatment: Fire retardant treat all wood framing, plywood and plywood sheathing by pressure treating with Dricon® fire retardant chemicals, by Arch Wood Protection, Inc. Kiln dry all pieces after treatment. Identify all treated pieces with an Underwriters Laboratories, Inc., label or marking, prior to shipment to site. Treatment shall be in accordance with the impregnating salt manufacturer’s U.L. approved, specifications, and shall render the wood fire retardant to the extent that the flame spread does not exceed 25 per ASTM Standard E84 modified to require a 30 minute test period. The treating process shall conform to the requirements of the applicable AWPA Standard C1, C2, C3, C4, C9, C14, C15, C16, C22, C23, C24, C28, C31, C33 and M4, for the species, product, preservative and end use. Preservatives shall conform to AWPA P1/P13, P2, P5, P8 and P9. Include certification by treatment plant that the treatment will not bleed through finished surfaces.

D. Certification: Submit certificates of wood treatments. Stamp or brand lumber before delivery, indicating treatment applied.

E. Exposed Wood/ Field-Cuts: Surfaces of treated wood exposed by cutting or drilling at the job site shall be treated with heavy brush coat of same preservative or fire-retardant treatment used in treatment.

2.03 ROUGH HARDWARE

A. General: Furnish all items of rough hardware such as spikes, nails, screws, bolts, anchors, brackets, etc., necessary for the installation of this Work.

B. Bolts, Nuts, and Expansion Shields: Use galvanized steel bolts for all bolting Work. Use carriage bolts and nuts, or welded stud bolts and nuts for securing wood members to steel framing. Use metallic expansion shields for securing bolts to concrete. Use similar shields or toggle bolts for securing to masonry. Select length of bolts to suit thickness of material being joined.

C. Nails: Use galvanized steel nails for all Work. Do not use aluminum nails. Except as otherwise specified, use common nails for securing of rough carpentry, use casing or finish nails, counter-set, for securing of finish carpentry.

D. Corrosion Rates: Rough hardware in contact with fire retardant treated wood shall exhibit corrosion rates less than one mil per year when tested.

2.04 MISCELLANEOUS

A. General: Miscellaneous materials specified herein represent products from the McMaster-Carr Supply Company, P.O. Box 94930, Cleveland, OH 44101-4930, (330)995-5500, and illustrate the type, material, quality, required. Comparable products may be acceptable, subject to the Architect’s review.

1. Fastening Hardware: Provide materials such as screws, bolts, nuts, washers, nails, anchors, and miscellaneous other fastening products as required by the Drawings and/or field conditions.

B. Counter Supports:

1. Support bracket to be fully recessed 2" x 2" x 0.25" aluminum “T” extrusion, 12" x 14", as manufactured Equal to: Rangine Corp., 330 Reservoir Street, Needham, MA 02494, (800)826-6006, www.rakks.com.

2. Support angle to be 1-1/4" x 1-1/4" x 3/16" aluminum angle as supplied Equal to: McMaster-Carr Supply Co., P.O. Box 94930, Cleveland, OH 44101, (330)995-5500, www.mcmaster.com.

C. TV Wall Mount Bracket: Provide TV Mounting Bracket Anchor Kit, Part PAC-115, as recommended by Bracket Manufacturer. Bracket Manufacturer is Equal to: Chief Manufacturing. Anchor kit can be purchased online through www.Amazon.com or www.Clubmac.com.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 FINISH CARPENTRY WORK

A. General:

1. All Finish Carpentry Work shall be executed by skilled mechanics in a workmanlike manner. All joints shall be neatly and accurately made, closely fitted and assembled to remain tight and conceal any shrinkage.

2. All wood shall be well sanded to perfectly smooth surfaces, touched-up by hand and made suitable to receive paint or stain finish Work by Painting Contractor.

3. Protect all wood finishes from damage due to traffic or other construction Work, by covering with building paper and boards. Protection shall be particularly required for the jambs of openings through which material is being transported.

B. Finish Hardware: All finish hardware for wood doors and for hollow metal doors will be furnished by the Finish Hardware Contractor to Carpentry Contractor for installation. Prepare all doors to receive the hardware. Install and adjust all hardware properly, in accordance with the manufacturer's instructions. Attach and secure the hardware so that no parts are damaged or injured. Install weather stripping, door sweeps, and overhead rain drip at exterior doors.

C. Architectural Millwork: Install at locations indicated on the Drawings, all wood products as specified herein.

D. Corner Guards:

1. Project Conditions and Temperature: Materials must be acclimated in an enclosed environment of 65°-75°F for at least 24 hours prior to beginning the installation. Temperature at the time of installation must be between 65°-75°F and be maintained for at least 48 hours after the installation.

2. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.

3. Surface Preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.

4. Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

5. Installation: Install and clean corner guards in strict accordance with the manufacturer's installation and cleaning method recommendations. Use only contact cement recommended by manufacturer, and locate all components firmly into position, level and plumb.

3.03 CLEAN-UP

A. Work Required: Clean-up or repair adjacent finish Work which is soiled, marred, or damaged by the Work of this section, at Contractor's expense.

B. Debris and Waste Materials: During progress of the Work, the premises shall be kept free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish from the site and dispose of legally. Upon completion and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Standard and custom hollow metal doors and frames.
2. Steel sidelight, borrowed lite and transom frames.
3. Louvers installed in hollow metal doors.
4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

1. Division 01 Section "General Conditions".
2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
5. Division 08 Section "Door Hardware".
6. Division 08 Section "Access Control Hardware".
7. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.
8. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.
9. Division 28 Section "Access Control" for access control devices installed at door openings and provided as part of a security access control system.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40” above sill) or UL 10C.

1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
3. Smoke Control Door Assemblies: Comply with NFPA 105.

    a. Smoke "S" Label: Doors to bear “S” label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

E. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and

Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:

1. CECO Door Products (C).
2. Curries Company (CU).

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.

B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.

1. Design: Flush panel.
2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 “Laminated Core”.

    a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
    c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.

3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).

5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Design: Flush panel.

    a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.

2. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
3. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
4. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
5. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Manufacturers Basis of Design:

1. CECO Door Products (C) Honeycomb Core - Regent Series.
2. CECO Door Products (C) Energy Efficient - Trio-E Series.

2.4 HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
2. Manufacturers Basis of Design:

    a. CECO Door Products (C) – SU SR Series.

C. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.

1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.

2. Manufacturers Basis of Design:

    a. CECO Door Products (C) - BU DU Series.
    b. CECO Door Products (C) - SU Series.

D. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

E. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.

1. Blade Type: Vision proof inverted V or inverted Y.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.

1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 LIGHT OPENINGS AND GLAZING

A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.

B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.

C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.

D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".

D. Hollow Metal Frames:

1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

    a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.

3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
9. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

11. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.10 STEEL FINISHES

A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.

1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION 081113

SECTION 08 14 16
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.

2. Shop priming flush wood doors.

3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 062000 "Finish Carpentry”.

2. Section 088000 "Glazing" for glass view panels in flush wood doors.

3. Section 099000 "Paints and Coatings.”

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation 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, and trim for openings.

B. 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. Requirements for veneer matching.

6. Doors to be factory finished and finish requirements.

7. Fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.

2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

B. Quality Standard Compliance Certificates: AWI Quality Certification WI Certified Compliance Program certificates.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.

1.7 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.

1.8 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.

B 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 temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.9 WARRANTY

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 in a 42-by-84-inch section.

b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch 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 Interior Doors: Life of installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ampco.

2. Eggers Industries.

3. Graham Wood Doors; an Assa Abloy Group Company.

4. Haley Brothers, Inc

5. Marlite.

B. Source Limitations: Obtain flush wood doors indicated to be blueprint matched with paneling and wood paneling from single manufacturer.

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. WDMA I.S.1-A Performance Grade: Heavy Duty.

D. WDMA I.S.1-A Performance Grade:

1. Heavy Duty unless otherwise indicated.

E. 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 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.

2. Temperature-Rise Limit: Where indicated, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

3. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

5. 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.

6. Pairs: Provide formed-steel edges and astragals with intumescent seals.

   a. Finish steel edges and astragals with baked enamel same color as doors.

   b. Finish steel edges and astragals to match door hardware (locksets or exit devices).

F. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

G. 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. follows:

   a. 5-inch top-rail blocking.

   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.

   c. 5-inch midrail blocking, in doors indicated to have armor plates.

   d. 4-1/2-by-10-inch lock blocks 5-inch midrail blocking], in doors indicated to have exit devices.

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.

   a. Screw-Holding Capability: 475 lbf 2110 N per WDMA T.M.-10.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

1. Species: Select white birch

2. Cut: Rift sawn.

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.

2. Species: Select white birch

3. Cut: Rift sawn.

4. Assembly of Veneer Leaves on Door Faces: Center-balance match.

5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

6. Exposed Vertical and Top Edges: Same species as faces or a compatible species - edge Type A

7. Core: Particleboard.

8. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot

9. Construction: Seven plies, either bonded or non-bonded construction.

10. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.4 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.

2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber**,** rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

D. 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."

3. Louvers: Factory install louvers in prepared openings.

E. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before shop priming factory finishing.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors with plastic laminate as noted on the drawings (PL-).

C. Factory finish doors where indicated in schedules or on Drawings as factory finished.

D. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Finish:

1. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 5, conversion varnish.

2. Finish: As noted on drawings.

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.

1. Install fire-rated doors according to NFPA 80.

2. Install smoke- and draft-control doors according to NFPA 105.

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 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, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

a. Comply with NFPA 80 for fire-rated doors.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

3. Bevel fire-rated doors 1/8 inch in 2 inches 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.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

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

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.

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 “Interior Aluminum Doors and Frames”.
3. Division 08 Section “Flush Wood Doors”.
4. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

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.

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 indicating compliance with the referenced testing 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 according 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. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in

writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
   d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:

   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:

   a. McKinney (MK) - TA/T4A Series, 5 knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.

1. Manufacturers:.

a. Pemko (PE).

2.4 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:

a. McKinney (MK) - QC (# wires) 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:

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. Provide one each of the following tools as part of the base bid contract:

a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:

    a. Rockwood (RO).

B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.

1. Manufacturers:

    a. Rockwood (RO).

C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:

    a. Rockwood (RO).

2.6 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. 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.

C. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
2. Manufacturers:

a. Sargent (SA) - Degree DG1.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. 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.

2.7 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:

a. Lund Equipment (LU).
b. MMF Industries (MM).

c. Telkee (TK).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all features and functionality as specified herein.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 8200 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:

a. Sargent Manufacturing (SA) - 4870 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 ELECTROMAGNETIC LOCKING DEVICES

A. Surface Electromagnetic Locks (Heavy Duty): Electromagnetic locks to be surface mounted type conforming to ANSI A156.23, Grade 2 with minimum holding force strength of 1,200

pounds. Locks to be capable of accepting between 12 to 24 volts direct current and be UL listed for use on fire rated door assemblies. Electromagnetic coils are to consume no more than 1.5W during normal operation. Locks are to have an integrated door position switch, tamper switch, and lock bond sensor. Locks are to have integrated motion sensor and/or security camera as indicated in the hardware sets. Locks to be capable of detecting door prop conditions and entering low power mode. Provide mounting accessories as needed to suit opening conditions. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.

1. Manufacturers:

    a. Securitron (SU) - M680E Series.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.

    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:

    a. Sargent Manufacturing (SA) - 80 Series.

2.13 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.
3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
4. Manufacturers:

    a. Sargent Manufacturing (SA) - 80 Series.

2.14 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 (Large Body Cast Iron): 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 body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Norton Rixson (NO) - 9500 Series.
b. Sargent Manufacturing (SA) - 281 Series.

C. 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. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:

a. Norton Rixson (NO) - 7500 Series.
b. Sargent Manufacturing (SA) - 351 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:

a. Rockwood (RO).

2.16 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

2.17 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2.18 ELECTRONIC ACCESSORIES

A. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

1. Manufacturers:

a. Alarm Controls (AK) - TS Series.
b. Securitron (SU) - PB Series.

B. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.

1. Manufacturers:

a. Securitron (SU) - XMS Series.

C. 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:

a. Sargent Manufacturing (SA) - 3280 Series.
b. Securitron (SU) - DPS Series.

D. 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:

a. Securitron (SU) - AQL Series.

2.19 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.

2.20 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 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.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. SU - Securitron
6. AK - Alarm Controls
7. OT - Other

Hardware Sets

Set: 1.0

Existing Exterior Door: 108B

1	Magnetic Lock	M680EBD x Mntg Brackets	630	SU
1	CVR Exit, NL	DG1 AD8610 106	US32D	SA
1	CVR Exit, EO	AD8610	US32D	SA
1	Drop Plate & Mounting Hardware	as required	EN	SA
1	Perimeter Seal	by door / frame mfg		
1	Door Release	TS-18		AK
1	Motion Sensor	XMS		SU
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Push Button	EEB3N		SU
1	Card Reader	By Security - Owner		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed and secured. Ingress by valid credential or remote release. Fail safe tied to fire alarm for simultaneous release, free egress at all times. Coordinate with security and electrical.

Set: 2.0

Doors: 100A

3	Hinge Full Mortise	TA 2714	US26D	PE
1	Rim Exit, NL, RX, ELR	DG1 55 56 8804	US32D	SA
1	Offset Door Pull	RM3311-24	US32D	RO
1	Door Closer w Stop	281 CPS	EN	SA
1	Drop Plate & Mounting Hardware	as required	EN	SA
1	Perimeter Seal	by door / frame mfg		
1	Sweep	315CN x Width		PE
1	Threshold	2005AT x Width		PE
1	ElectroLynx Harness - Frame	QC-C1500P		MK
1	ElectroLynx Harness - Door	QC-C*** x Length as required		MK
1	Door Release	TS-18		AK
1	Position Switch	DPS-M/W-WH (as required)		SU
1	Card Reader	By Security –By Owner		OT
1	Power Supply	AQLX-E1 - Size as required		SU

Notes: Door is normally closed, latched, and secured. Valid credential or remote release for ingress, free egress at all times. Coordinate with security and electrical.

Set: 3.0

Classroom Doors: 104, 105, 106, 107

3	Hinge, Full Mortise	TA2714	US26D MK
1	Classroom Lock	DG1 8237 LNMD	US26D SA
1	Surface Closer	351 Reg / PA	EN SA
1	Kick Plate	K1050 10" High x LDW CSK	US32D RO
1	Door Stop	406 / 409 / 446 as required	US26D RO
1	Gasketing	S88D (Head & Jambs)	PE

Set: 17.0

Restroom Doors: 112, 113

3	Hinge (heavy weight)	T4A3786	US26D MK
1	Classroom Deadlock	DG1 4877	US26D SA
1	Pull Plate	BF 110 x 70C	US32D RO
1	Push Plate	70E	US32D RO
1	Surface Closer	351 Reg / PA	EN SA
1	Mop Plate	K1050 4" High x LDW CSK	US32D RO
1	Kick Plate	K1050 10" High x LDW CSK	US32D RO
1	Door Stop	406 / 409 / 446 as required	US26D RO
3	Silencer	As req'd	RO
1	Gasketing	S88D Head and Jambs	PE

END OF SECTION 087100

SECTION 09 24 00
CEMENT PLASTERING

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. Exterior portland cement plasterwork (stucco) on paper backed metal lath over unit masonry.

B. Related Sections:

1. Section 054000 "Cold-Formed Metal Framing" for structural, load-bearing (transverse and axial) steel studs and joists that support lath and portland cement plaster.
2. Section 061000 "Rough Carpentry" for wood framing and furring included in portland cement plaster assemblies.
3. Section 061600 "Sheathing" for sheathing and water-resistant barriers included in portland cement plaster assemblies.
4. Section 072100 "Thermal Insulation" for thermal insulations and vapor retarders included in portland cement plaster assemblies.
5. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support lath and portland cement plaster.
6. Section 092300 "Gypsum Plastering" for gypsum-based conventional plaster and associated lath.
7. Section 092613 "Gypsum Veneer Plastering" for gypsum-based veneer plaster applied on gypsum base for veneer plaster, unit masonry, and monolithic concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other work.

C. Samples for Initial Selection: For each type of factory-prepared finish coat indicated.

D. Samples for Verification: For each type of textured finish coat indicated; 12 by 12 inches (305 by 305 mm), and prepared on rigid backing.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by, and displaying a classification label from, a qualified independent testing agency acceptable to the authority having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Construct fire-resistance rated partitions in compliance with tested assembly requirements where indicated on drawings.
2. Rated assemblies to be substantiated from applicable testing using proposed products, by Contractor.
3. Both metal framing and wallboard manufacturers must submit written confirmation that they accept the other manufacturer's product as a suitable component in the assembly. Acceptance is as follows:

    a. If installation of both products is proper, no adverse effect will result in the performance of one manufacturer's product by the other's product.
    b. Combining products can be substantiated by required assembly tests.

4. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

B. Sound-Transmission Characteristics: Where indicated, provide portland cement plaster assemblies identical to those of assemblies tested for STC ratings per ASTM E 90 and classified according to ASTM E 413 by a qualified testing agency.

C. Mockups: Before plastering, install mockups of at least 100 sq. ft. (9.3 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for each type of finish indicated.
2. For interior plasterwork, 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. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

B. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".

1.6 PROJECT CONDITIONS

A. Comply with ASTM C 926 requirements.

B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F (4.4 deg C) for at least 48 hours before plaster application, and continuously during and after application.

1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
2. Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.

C. Exterior Plasterwork:

1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
2. Apply plaster when ambient temperature is greater than 40 deg F (4.4 deg C).
3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

PART 2 - PRODUCTS

2.1 METAL LATH

A. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet, ASTM A 653/A 653M, G60 (Z180). Equal to: Clark Dietrich paper backed galvanized metal lath.

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by ClarkDietrich Building Systems or comparable product by one of the following:

   a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
   b. CEMCO.
   c. MarinoWARE.
   d. Phillips Manufacturing Co.

2. Diamond-Mesh Lath: Flat, Self-furring, 3.4 lb/sq. yd. (1.8 kg/sq. m)].

3. V Truss Corners - Exterior Corner Reinforcements:

   a. Profile: Straight.
   b. Finish: Class 1 Galvanized Coating complying with ASTM A 641.
   c. As per ICC ESR-2017.

4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Davis Wire Corporation; a Heico Wire Group company.
   b. Jaenson Wire Company.
   c. Keystone Steel & Wire Co.
   d. K-Lath; a division of Georgetown Wire.
   e. Architect approved equal.

B. Paper Backing: FS UU-B-790, Type I, Grade D, Style 2 vapor-permeable paper.

1. Provide paper-backed lath unless otherwise indicated at all exterior locations.

2.2 ACCESSORIES

A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by ClarkDietrich Building Systems or comparable product by one of the following:

   a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
   b. CEMCO.
   c. MarinoWARE.
   d. Phillips Manufacturing Co.
   e. Architect approved equal.

2. Foundation Weep Screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 (Z180) zinc coating.
3. Cornerite: Fabricated from expanded metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
4. Strip Lath: Fabricated from expanded-metal lath with ASTM A653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
5. External-Corner Reinforcement: Fabricated from metal lath with ASTM A 653/A 653M, G60 (Z180), hot-dip galvanized zinc coating.
6. Cornerbeads: Fabricated from zinc or zinc-coated (galvanized) steel.

   a. Small nose cornerbead with expanded flanges; use unless otherwise indicated.
   b. Small nose cornerbead with perforated flanges; use on curved corners.
   c. Small nose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing masonry corners.

7. Casing Beads: Fabricated from zinc or zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
8. Control Joints: Fabricated from zinc or zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
9. Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
10. Two-Piece Expansion Joints: Fabricated from zinc or zinc-coated (galvanized) steel; formed to produce slip-joint and square-edged reveal that is adjustable from 1/4 to 5/8 inch (6.34 to 16 mm) wide; with perforated flanges.

C. Accessories for Portland Cement Base Plaster: ASTM C 1063. Fabricated from Zinc Alloy (99 percent pure zinc), galvanized (zinc coated) steel, rigid PVC or CPVC plastic, or anodized aluminum alloy.

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by ClarkDietrich Building Systems or comparable products by one of the following:

    a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    b. Phillips Manufacturing Co.
    c. Plastic Components, Inc.
    d. Vinyl Corp.
    e. TXI Model Lone Star Stucco

2. Corner beads: With perforated flanges.

    a. Small nose corner bead; use unless otherwise indicated.

3. Casing Beads: With perforated flanges in depth required to suit plaster bases indicated and flange length required to suit applications indicated.

    a. Square-edge style; use unless otherwise indicated.

4. Control Joints: One-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
5. Expansion Joints: Two-piece type, formed to produce slip-joint and square-edged 1-inch-(25-mm-) wide reveal; with perforated concealed flanges.
6. Soffit Reveals: PVC reveals conforming to ASTM C 1047.

    a. Vinyl Corp. "No. DC58-50SE".

7. Soffit Vents: Vinyl soffit vent.

    a. Vinyl Corp. "No. CSJ50-200V".

D. Plastic Accessories for Gypsum Wallboard and Gypsum Veneer Base: ASTM C847. Fabricated from plastic or plastic and paper in combination shall be manufactured from rigid PVC, ABS, PETG, high-impact polystyrene (HIPS), or polycarbonate (PC) plastic not less than 0.028 inch (0.7112 mm) and Section 4.3.1 PVC specification D 3678 Class II.

1. Basis-of Design Product: Subject to compliance with requirements, provide products by ClarkDietrich Building Systems or comparable products by one of the following:

    a. Alabama Metal Industries Corporation; a Gibraltar Industries company.
    b. Plastic Components, Inc.
    c. Vinyl Corp.
    d. Architect approved equal

2.3 MISCELLANEOUS MATERIALS

A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.

B. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch (13 mm) long, free of contaminants, manufactured for use in portland cement plaster.

C. Bonding Compound: ASTM C 932.

D. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.

E. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.

F. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch (1.21-mm) diameter, unless otherwise indicated.

2.4 PLASTER MATERIALS

A. Portland Cement: ASTM C 150,Type II.

1. Color for Finish Coats: Gray.

B. Masonry Cement: ASTM C 91, Type N.

1. Color for Finish Coats: Gray.

C. Plastic Cement: ASTM C 1328.

D. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.

E. Sand Aggregate: ASTM C 897.

1. Color for Job-Mixed Finish Coats: White note: stucco is to be painted with elastomeric paint.

F. Perlite Aggregate: ASTM C 35.

G. Ready-Mixed Finish-Coat Plaster: Mill-mixed portland cement, aggregates, and proprietary ingredients.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Bonsal American, an Oldcastle Company; Marblesil Stucco Mix.
b. TXI Model- Lone Star Stucco
c. El Rey Stucco Company, Inc., a brand of ParexLaHabra, Inc.; Premium Stucco Finish.
d. Florida Stucco; Florida Stucco.
e. LaHabra, a brand of ParexLaHabra, Inc.; Exterior Stucco Color Coat.
f. Omega Products International, Inc.; ColorTek Exterior Stucco.
g. QUIKCRETE; QUIKCRETE Finish Coat Stucco, No. 1201.

2. Color: with-out color agent as the stucco is to receive coats of elastomeric paint.

2.5 PLASTER MIXES

A. General: Comply with ASTM C 926 for applications indicated.

1. Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least two minutes. Comply with fiber manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. (0.6 kg of fiber/cu. m) of cementitious materials.

B. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:

1. Portland Cement Mixes:

a. Scratch Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

2. Masonry Cement Mixes:

a. Scratch Coat: 1 part masonry cement and 2-1/2 to 4 parts aggregate.
b. Brown Coat: 1 part masonry cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.

3. Portland and Masonry Cement Mixes:

a. Scratch Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

4. Plastic Cement Mixes:

a. Scratch Coat: 1 part plastic cement and 2-1/2 to 4 parts aggregate.
b. Brown Coat: 1 part plastic cement and 3 to 5 parts aggregate, but not less than volume of aggregate used in scratch coat.

5. Portland and Plastic Cement Mixes:

a. Scratch Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
b. Brown Coat: For cementitious material, mix 1 part plastic cement and 1 part portland cement. Use 3 to 5 parts aggregate per part of cementitious material, but not less than volume of aggregate used in scratch coat.

C. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows:

1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 0 to 3/4 part lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
2. Portland and Masonry Cement Mix: For cementitious material, mix 1 part portland cement and 1 part masonry cement. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.

D. Base-Coat Mixes: Single base coats for two-coat plasterwork as follows:

1. Portland Cement Mix: For cementitious material, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material.
2. Masonry Cement Mix: Use 1 part masonry cement and 2-1/2 to 4 parts aggregate.
3. Plastic Cement Mix: Use 1 part plastic cement and 2-1/2 to 4 parts aggregate.

E. Job-Mixed Finish-Coat Mixes:

1. Portland Cement Mix: For cementitious materials, mix 1 part portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
2. Masonry Cement Mix: 1 part masonry cement and 1-1/2 to 3 parts aggregate.
3. Portland and Masonry Cement Mix: For cementitious materials, mix 1 part portland cement and 1 part masonry cement. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
4. Plastic Cement Mix: 1 part plastic cement and 1-1/2 to 3 parts aggregate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.

B. Prepare solid substrates for plaster that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.

3.3 INSTALLATION, GENERAL

A. Fire-Resistance-Rated Assemblies: Install components according to requirements for design designations from listing organization and publication indicated on Drawings.

B. Sound Attenuation Blankets: Where required, install blankets before installing lath unless blankets are readily installed after lath has been installed on one side.

C. Acoustical Sealant: Where required, seal joints between edges of plasterwork and abutting construction with acoustical sealant.

3.4 INSTALLING METAL LATH

A. Expanded-Metal Lath: Install according to ASTM C 1063.

1. Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
2. Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.
3. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh welded-wire lath.

3.5 INSTALLING ACCESSORIES

A. Install according to ASTM C 1063 and at locations indicated on Drawings.

B. Reinforcement for External Corners:

1. Install lath-type, external-corner reinforcement at exterior locations.
2. Install corner bead at interior and exterior locations.

C. Control Joints: Install control joints at locations indicated on Drawings.

1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:

a. Vertical Surfaces: 144 sq. ft. (13.4 sq. m).
b. Horizontal and other Nonvertical Surfaces: 100 sq. ft. (9.3 sq. m).

2. At distances between control joints of not greater than 18 feet (5.5 m) o.c.
3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2-1/2:1.
4. Where control joints occur in surface of construction directly behind plaster.
5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

3.6 PLASTER APPLICATION

A. General: Comply with ASTM C 926.

1. Do not deviate more than plus or minus 1/4 inch in 10 feet (6.4 mm in 3 m) from a true plane in finished plaster surfaces, as measured by a 10-foot (3-m) straightedge placed on surface.
2. Finish plaster flush with metal frames and other built-in metal items or accessories that act as a plaster ground unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

B. Bonding Compound: Apply on unit masonry plaster bases.

C. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork**,** on masonry; 3/4-inch (19-mm) thickness.

1. Portland cement mixes.
2. Masonry cement mixes.
3. Portland and masonry cement mixes.
4. Plastic cement mixes.
5. Portland and plastic cement mixes.

D. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 inch (19 mm) .

1. Portland cement mixes.
2. Masonry cement mixes.
3. Portland and masonry cement mixes.
4. Plastic cement mixes.
5. Portland and plastic cement mixes.

E. Walls; Base-Coat Mix: Scratch coat for two-coat plasterwork, 3/8 inch (10 mm) thick on concrete masonry.

1. Portland cement mixes.
2. Masonry cement mixes.
3. Portland and masonry cement mixes.
4. Plastic cement mixes.
5. Portland and plastic cement mixes.

F. Ceilings; Base-Coat Mix: Scratch coat for two-coat plasterwork, 1/4 inch (6 mm) thick on concrete.

1. Portland cement mixes.
2. Masonry cement mixes.
3. Portland and masonry cement mixes.
4. Plastic cement mixes.
5. Portland and plastic cement mixes.

G. Plaster Finish Coats: Apply to provide sand texture finish at all exterior walls..

H. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.

I. Concealed Interior Plasterwork:

1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
2. Where plaster application will be concealed above suspended ceilings and in similar locations, finish coat may be omitted.
3. Where plaster application will be used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.7 PLASTER REPAIRS

A. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

3.8 PROTECTION

A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces not indicated to be plastered. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.

END OF SECTION

SECTION 09 29 00
GYPSUM WALLBOARD

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, and services necessary for Gypsum Wallboard Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:

1. Gypsum Wallboard Materials and Accessories.

2. Sound-rated Construction.

3. Non-Load Bearing Metal Stud Framing for Interior Work.

4. Load-Bearing Metal Stud Framing for Interior Work.

5. Suspension System for Gypsum Wallboard.

6. Fire-Rated Wall Construction.

7. Gypsum Sheathing Panels and Accessory Materials.

8. Sanding preparation for painting.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Concrete Forms and Accessories- Section 03 10 0.

2. Unit Structural Masonry - Section 04 23 00.

3. Cold-Formed Metal Framing- Section 05 40 00.

4. Miscellaneous Metal Work - Section 05 50 00.

5. Rough Carpentry Work - Section 06 10 00.

6. Thermal Insulation - Section 07 21 00.

7. Board Insulation - Section 07 21 20.

8. Plaster Veneer System - Section 07 24 00.

9. Joint Protection - Section 07 90 00.

10. Aluminum Storefronts - Section 08 41 10.

11. Tile Work - Section 09 31 00.

12. Acoustical Panel Ceiling - Section 09 51 13.

13. Resilient Bases and Accessories- Section 09 65 13.

14. Paint and Coatings - Section 09 90 00.

1.02 REFERENCE SPECIFICATIONS

A. ASTM International Standard Specifications: As refered to herein, and throughout this section.

1. ASTM C11 - Standard Terminology Relating to Gypsum and Related Building Materials and Systems.

2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

3. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.

4. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.

5. ASTM C1177 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

6. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.

7. ASTM C1396 - Standard Specification for Gypsum Board.

8. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C.

1.03 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

C. Product Data: Submit Product Data for each type of product specified.

D. Shop Drawings:

1. Load Bearing Framing: Include placing drawings for framing members showing size and gauge designations, number, type, location, and spacing. Indicate supplemental strapping, bracing, splices, accessories, and details required for proper installation. Detail connections to structural steel and structural concrete. Indicate member gauges, spacing, and sizes.

2. Structural Calculations: Submit complete structural calculations for load bearing metal stud framing indicating loads, stresses, and deflections for members and connections. Calculations shall be sealed by a Professional Engineer licensed in the State of the proposed Project, experienced in the design of light gauge framing.

1.05 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products, under the following conditions:

1. Gypsum Board Partitions:

a. Standard Systems: Maximum deflection of L/240 of partition height.

b. Systems to receive Water-Resistant Gypsum Board or Cement Backer Board: Maximum deflection of L/360 of partition height.

2. Interior Suspended Ceilings and Soffits: Maximum deflection of L/360 of distance between supports.

B. Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM E90 - Standard Test ethod for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.06 DELIVERY AND STORAGE

A. General:

1. Deliver all materials to the site in protective wrappings, clearly labeled with pertinent information to facilitate checking. Unload in areas designated by the General Contractor.

2. When material delivery schedules necessitate delivery of the materials before the building is enclosed, or prior to installation of the materials, provide weathertight protection in the form of frame construction, with solid wall sheathing and a pitched roof, for the temporary storage of the materials. A waterproof covering of wallboard in lieu of the temporary building is not acceptable.

B. Gypsum Wallboard: When delivered, the wallboard with unbroken bundling tape shall be neatly piled flat on the floor without overlapping the floor. Storage area shall be protected from the weather.

C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.07 PROJECT CONDITIONS

A. Exterior gypsum soffit panel application and joint finishing, exterior Work temperature shall be a minimum of 55°F.

B. Interior gypsum panel application and joint finishing within the building, maintain temperatures within the range of 55°F. to 70°F.

C. Provide ventilation to remove excess moisture.

D. Rooms or areas in which Work is to be installed shall be at temperatures as specified herein, twenty-four (24) hours prior to installation to at least five (5) days after completion of installation. Refer to Division 00 “Supplementary Conditions” for description of temporary heat.

1.08 SCAFFOLDING

A. Furnish, erect, and maintain all scaffolding and ladders in accordance with local, state, and national safety codes. Equipment shall be erected at times and locations so as not to delay any part of Work. When no longer required, promptly dismantle equipment and remove from site.

1.09 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

1.10 MATERIAL DELIVERY, STORAGE & HANDLING

A. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART 2 - PRODUCTS

2.01 A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 GYPSUM WALLBOARD MATERIALS AND ACCESSORIES

A. Gypsum Wallboard: ASTM Standard 48" wide sheets with tapered or rounded (eased) edges, in lengths as long as practical to minimize jointing, of thickness shown on Drawings, as manufactured by United States Gypsum Company, a subsidiary of USG Corporation; National Gypsum Company; or G-P Gypsum Corporation. Provide the following types:

1. Standard Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM Standard C36).

2. Type X Fire-Rated Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM Standard C36).

3. Water-Resistant Gypsum Wallboard: ASTM Standard C1396 (formerly ASTM C630).

4. Foil-Back Standard Gypsum Wallboard: ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. Joint Tape, Joint Cement, and Adhesives:

1. Joint Tape: Perforated paper tape made especially for drywall joint reinforcing, conforming with ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

2. Joint Cement: Two compound system (joint compound and topping compound) conforming with ASTM Standard C475.

   a. Provide special joint cement recommended by manufacturer for water-resistant gypsum board.

3. Adhesives: Provide adhesives conforming to ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Frame, as recommended by the wallboard manufacturer.

   a. Volatile Organic Compounds (VOC) Content: paint and coatings product specified herein shall have a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

C. Metal Stud Framing Systems:

1. Non Load-Bearing: Framing system consisting of metal studs of sizes required for wallthicknesses, or of sizes noted on the Drawings, with mating floor and ceiling track, and all erection accessories. Studs and tracks shall be of cold rolled steel channels conforming to ASTM Standard C645, with an electro-galvanized finish, of not less than the following thicknesses.

   a. 25 gauge thick for partitions up to 16'-0" high at 16" O.C.

   b. 20 gauge thick for partitions over 16'-0" high (but less than 18'-0" high), at 16" O.C.

   c. Where partitions of greater height are required by the Drawings, a heavier gauge shall be required and shall be subject to the Architect's review.

2. Load-Bearing: Galvanized steel framing system conforming to ASTM C955 – Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; shall be 20 gauge (min.) “SJ” style stud members (“C” type studs with stiffening ribs) of sizes and lengths noted on

Drawings, with mating running track, and all required erection accessories such as lintels, strappings, clip angles, joists, as manufactured by United States Gypsum Company.

3. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

D. Steel Channels: 1-1/2" cold rolled steel channels weighing not less than 475 pounds per 1000 linear feet; 2-1/2" cold rolled steel channels weighing not less than 800 pounds per 1000 linear feet. All channels shall be galvanized.

1. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

E. Furring Channels: Provide furring widths (depths) as noted on the Drawings.

1. Hat-Shaped Channels: Cold rolled, electro-galvanized sheet steel, United States Gypsum Company, #DWC-25, 7/8" deep, 25 gauge minimum, conforming to ASTM Standard C645.

2. Z-Furring Channels: Interior Framing Product, Z-Furring (ZF-Series) as manufactured by Dietrich Metal Framing, 200 Old Wilson Bridge Road, Columbus, OH 43085, (800)873-2604. Furring channels shall be 25 gauge (minimum) corrosion resistant galvanized steel, conforming to ASTM Standards A653 and A754.

3. Recycled Content of Steel Products: Provide products with an recycled content of steel so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

F. Felt Protection Strips: Provide Type I, No. 15, unperforated felt conforming to ASTM D226 – Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing, in width as required to fully cover contact surface area between metal studs and/or furring channels and exterior wall.

G. Hangers: Not less than 8 ga. annealed zinc coated steel wire or 1" x 1/8" unperforated galvanized steel bands.

H. Tie Wire: Stainless steel or annealed zinc coated steel wire, 16 gauge minimum.

I. Screws: Phillips head screw fasteners conforming to ASTM Standard C954, with self-drilling point, self-tapping thread, and rust resistant coating, not less than #6 x 1" long, except as otherwise required for fire resistive ratings.

J. Nails: GWB-54, bright finish, annular ringed nails conforming with ASTM Standard C514 (formerly ASTM Standard C380), of length to provide 3/4" minimum penetration into framing or furring, except as otherwise required for fire resistive ratings.

K. Corner Beads: Formed to an angle of 90 degrees, zinc-coated steel not lighter than 26 gauge (0.0179 inch in normal thickness) with wings not less than 7/8 inch wide and perforated for screws/nails and cement treatment, or formed of zinc-coated steel or protected aluminum with legs approximately 3/4" wide and cemented under pressure with a rubber base adhesive to tough paper jointing tape wings not less than 1" wide. Zinc-coated steel shall conform to Federal Specification QQ-S-775 Type I, Class C.

L. Casing Beads: United States Gypsum Company, USG - No. 200-A galvanized metal trim, or equivalent 26 gauge galvanized casing bead by National Gypsum Company.

M. Control Joints: United States Gypsum Company, USG - Zinc Control Joint No. 093, or equivalent 26 gauge galvanized metal control joint product by National Gypsum Company.

N. Special Trim: Provide where/if indicated, special trim fabricated from No. 26 gauge galvanized sheet steel to the shape shown on Drawings.

O. Angle-Type Hangers: Unless otherwise indicated on the Drawings provide angles with legs not less than 7/8 inch wide, formed from 0.0635 inch thick galvanized steel sheet complying with ASTM Standard A653 (formerly ASTM Standard A446), Coating Designation G90, with bolted connections and 5/16 inch diameter bolts.

2.03 GYPSUM SHEATHING PANELS AND MATERIALS

A. Manufacturers: Panels specified herein shall be as manufactured by Georgia-Pacific Gypsum LLC, 133 Peachtree Street, Atlanta, GA, 30303, (800)947-4497 or (800)225-6119.

1. Comparable Products: Gypsum sheathing panels by manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect’s review.

B. Gypsum Sheathing Panels:

1. At Plaster Veneer System: ASTM Standard C1396 (formerly ASTM Standard C79).

2. At Plaster Veneer System: When extensive winter weather exposure is anticipated, provide square edge, noncombustible, gypsum sheathing panels, in

accordance with ASTM Standards E136, C1177 and C1396 (formerly ASTM Standard C79), 1/2" (nominal thickness) Dens- Glass™ Exterior Sheathing (formerly Dens-Glass® Gold Exterior Sheathing with R-Value of 0.56 when tested in accordance with ASTM Standard C518. Gypsum panels shall be made of a treated, water-resistant core, surfaced with fiberglass mats and a “Gold” colored primer coating.

C. Accessory Materials:

1. Fasteners: Steel drill screws, in lengths recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating.

a. For steel framing less than 0.0329 inch thick, attach sheathing with steel drill screws complying with ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

b. For steel framing from 0.033 to 0.112 inch thick, attach sheathing with steel drill screws complying with ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 COLD-FORMED (LOAD-BEARING) METAL FRAMING

A. Exterior Metal Framing: Metal framing shown on Drawings for gypsum wallboard sheathing shall be furnished and installed by the Cold-Formed Metal Framing Contractor.

B. Wood Framing and Furring: Wood framing and furring where shown on Drawings for gypsum wallboard finish shall be furnished and installed by the Rough Carpentry Contractor.

C. Load Bearing Metal Stud Framing: Provide load bearing metal stud and joist framing at the following locations:

1. Toilet Room walls and ceilings.

2. As indicated on the Drawings.

3.03 METAL STUD FRAMING (NON LOAD-BEARING TYPE STUDS)

A. Furnish and install non-load bearing metal stud framing for gypsum wallboard partitions, support of gypsum wallboard in locations noted, or where other types of framing are not provided. Framing shall consist of vertical studs framed into continuous top and bottom tracks. Studs shall be of sizes noted on the Drawings or as required to produce the partitions of thicknesses noted, and tracks shall be of mating sizes. In general, framing shall be of single stud depth. Where wall thickness is greater than stud depths, and where plumbing spaces are indicated, frame each wall surface with a separate stud frame.

1. Where partitions are to have gypsum wallboard on both sides, use 25 gauge metal studs for partitions up to 16'-0" high; use 20 gauge metal studs for partitions from 16'-0" to 18'-0" in height.

2. Where partitions are to have gypsum wallboard on one side only, use 25 gauge metal studs for partitions up to 14'-6" high; use 20 gauge metal studs for partitions from 14'-6" to 17'-3" in height. At these partitions (wallboard at one side), provide continuous cold rolled stiffener channels at third points, secured with screws or by welding. Securing by wiring shall not be accepted.

3. The above gauge requirements are based on 3-5/8 inch deep studs at 16" centers. Metal gauges for studs of different depth or spacings shall be subject to review by the Architect.

B. Extend partition framing from floor to underside of finish ceilings, to 6" minimum above finish ceilings, or to underside of metal roof deck construction above, as indicated on the Drawings.

C. Bottom and Top Track Installation:

1. Secure bottom tracks to supporting construction, both ends, corners, jambs of openings, and 24" centers with bolts and metallic expansion sleeves.

2. Where partition framing extends to underside of metal roof deck, secure top track to roof steel framing where perpendicular thereto. Where partitions are parallel to roof steel, brace top track to adjacent building framing with pieces of studs, at 48" O.C., maximum. Insulation Contractor shall furnish safing insulation for top track and where indicated on Drawings.

a. Isolate stud system from transfer of structural loading to system, horizontally and vertically. Provide slip type joints to attain lateral support, allowances for deflection, and avoid axial loading.

3. Where partition framing are ceiling high and ceilings are finished with gypsum wallboard, secure top track through wallboard to ceiling framing, at each intersection.

4. Where partition are ceiling high and ceilings are acoustical ceilings, after acoustic panels above partition are installed, install top track at underside of ceiling grid by bolting the tracks to the grid, separating top track from ceiling with a strip of polyethylene film.

5. In all areas of ceiling high partition, and in areas where framing extends only 4" above finish ceilings, conceal brace the top of the partition to steel framing at 48" O.C., maximum, in the area above the ceilings.

D. Furnish single length, unspliced studs for all locations. Furnish studs cut short to provide a 1/2" space between top of stud and underside of top track. Secure studs at corners, intersections, ends and both sides of openings to bottom track, at both stud flanges, with screws. In all other locations studs shall twist into tracks so as to be held by friction and to permit differential deflection between top and bottom track support construction. NOTE: In fire-rated walls frame fastening shall be in accordance with code requirements governing fire-rated construction.

E. Framing:

1. Frame partition corners by butting one wall against the other, with one stud at the end of the abutting wall and with two studs at the end of the other wall, forming a three stud corner.

2. Frame partition intersections by butting the intersecting wall against the wallboard-finished through-wall, providing two studs at intersection in through-wall, one stud at end of abutting wall, and bolting stud at end of abutting wall to wallboard of through-wall, at 24" O.C.

3. Frame openings with floor track at head and sills, welded to stud at jambs, with jack studs above and below openings to continue stud spacing pattern, omitting sill and bottom studs at door openings. Brace studs at jambs of openings back to first adjacent stud with furring channels at head and at 24" O.C. to floor line, welded in place at both ends.

4. Control joints shall be framed by placing two studs back to back, with a 1/2" open space between backs, and by interrupting tracks with a 1/2" open space, at the joint.

F. Completed framing shall provide straight true, plumb planes to receive the gypsum wallboard. Openings shall be true rectangles.

3.04 CEILING AND SOFFIT FRAMING

A. Furnish and install a concealed framing system for all gypsum wallboard ceilings (except toilet room ceiling), consisting of 1-1/2" runner channels, spaced not over 4'-0" on centers, erected parallel to partitions and walls. Hang suspended ceiling framing from the steel framing above.

B. Hang runner channels from above the hangers spaced at 48" O.C., maximum, along each channel. Erect hangers approximately plumb. Wrap each wire hanger around the runner channel, the steel joist, and around itself three times. If steel band hangers are used, secure each steel band to the runner channel by wrapping tightly around the channel and bolting to itself. All connections shall develop the full strength of the hangers.

1. Do not attach hangers to roof deck, ductwork, duct supports, piping, conduit or hangers for same.

2. Where ductwork or other construction interferes with typical hanger spacing, provide trapezes, or other approved framing, to frame around such items and to support the hangers.

3. Pairs of diagonal hangers, extending from runner at midpoint between joists to top chord of joists at each side may be provided to reduce hanger spacing to 48" centers or less along the runner.

4. Provide additional hangers at light fixtures, diffusers, grilles, and other points of extra loading.

C. Erect runners level, parallel to room walls and parallel to each other. Provide a runner adjacent to, and within 3" of, walls where parallel to same. Provide runners at top and bottom edges of all ceiling drops. Cut off ends of runners 1/2" from walls where perpendicular thereto. Splice, when required, at hangers only, by lapping 12" and securely tying.

D. Where control joint or expansion joint is required by Drawings or Specifications, and runners are parallel to the joint, provide runner channel at each side of joint and secure each, independently of each other, to the framing above. Where runners are perpendicular to the joint, terminate runners at each side of joint, allowing a 1/2" wide, minimum, break in the runners, aligned with joint.

E. Frame and brace all openings in ceilings that have any side dimension over 2 ft. as a part of the suspension system. Provide all required metal framing, bracing, supports, blocking

and wedging necessary to install the framing rigidly and securely in position. Do all cutting and drilling required to install and fasten framing and furring in place. Erect runners to true lines, levels and planes so as to provide a true, flat, system or surface to receive the succeeding Work.

3.05 METAL FURRING

A. Furnish and install metal furring to support gypsum wallboard ceilings, ceiling drops, and soffits at the lines and elevations as shown and/or noted on the Drawings.

B. Erect furring in straight continuous rows and in parallel alignment, spaced l6" O.C. Splice furring, where required, by nesting or lapping adjacent members not less than 8" and by double tying the lap splice.

1. At ceilings, ceiling drops, and soffits, erect furring at right angles to supporting framing.

2. Where furring is parallel to edges of wallboard finish, provide a furring member at wallboard edge.

3. Where furring is at right angles to edges of wallboard finish, extend furring to such edges, mitering or coping members at corners.

C. Where control joint or expansion joint is required provide a furring member at each side of joint, along edge of wallboard.

D. Provide steel framing, bracing, shimming and supplementary framing as required to erect furring at the required lines and elevations. Secure furring to ceiling framing runners and to building framing by saddle tying with two (2) strands of tie wire.

E. Direct Metal Stud and/or Furring Channel Attachment to Walls: Where dampproofing is not indicated and/or specified and metal stud and/or furring channel is installed directly to exterior wall, install felt protection strip between metal stud and/or furring channel and wall. Attach metal furring channels, spaced 24" O.C. maximum unless otherwise as noted on the Drawings, to interior of masonry and/or concrete surfaces with hammer-set or power-driven fasteners staggered 24" O.C. maximum on opposite flanges.

3.06 GYPSUM WALLBOARD INSTALLATION

A. Furnish and install gypsum wallboard on the exposed side or sides of stud partition framing and coldformed metal framing, on one side of all furred areas, fire stops, and where shown on Drawings.

1. Unless otherwise indicated on the Drawings, provide multiple-layer wallboard as indicated or required for fire-rated partition construction. Provide single layer wallboard for all other locations.

    a. Refer to the Drawings for partition framing construction requiring wallboard to metal roof deck.

    b. Provide fire-rated gypsum wallboard where indicated on Drawings.

    c. Provide exterior gypsum wallboard sheathing at exterior wall areas for plaster veneer system as indicated on Drawings.

    d. Provide water-resistant gypsum wallboard at interior face side of Toilet Room walls, and other locations as indicated on the Drawings.

    e. Provide foil-faced gypsum wallboard where indicated on Drawings.

    f. Provide standard gypsum wallboard at all other areas.

2. Cover full height of stud partition framing with wallboard, including the portion above ceilings.

3. In all wall and partition Work, except where partition framings terminate at underside of ceilings, extend wall and partition wallboard up past edge of ceiling wallboard, and cope edge of ceiling wallboard to such vertical surfaces forming a control joint.

4. At all control joints, provide a 1/4" wide, straight open joint in the wallboard, at the joint centerline.

5. In addition to the required fastening of wallboard panels vertically, secure gypsum wallboard at partitions with screws 16" O.C. to bottom and top track; at FIRE-RATED PARTITION(S), spacing of screws at bottom and top track shall be 8" O.C.

B. Installations:

1. Single Layer Installations:

    a. If wallboard is obtainable in length to span full height in a single piece, install wallboard with long dimension vertical; otherwise install wallboard with long dimension horizontal; with vertical joints aligned over studs or furring in both cases.

b. At soffit/ceiling and soffit/ceiling drop Work, install wallboard with long dimension at right angles to support framing, with end joints aligned over framing members.

c. Apply all wallboard with the reverse side against the framing members, and with the separate boards in moderate contact, but not forced into place. At internal and external corners, conceal the cut edge of the boards with the overlapping covered edge of the abutting board. Stagger the boards so that the corners of any four boards will not meet at a common point except in vertical corners.

2. Double Layer Installations:

a. Install and secure the base layer of wallboard in accordance with requirements specified above for single layer installation, except wallboard on walls and partitions may be installed with long dimension horizontal in all cases.

b. Apply face layer of wallboard over base layer in same manner and positioning as specified for base layer, off-setting joints not less than 10" from joints of base layer. Secure face layer to base layer with full, uniform coatings of adhesive, applied to both contact surfaces with a brush, roller or serrated spreader. Impact layers together to insure thorough and maximum bonding. Form corners by overlapping board ends of base layer. Provide screw or nail fastening to supplement adhesive fastenings as may be required.
NOTE: At fire-rated installations, supplemental fastening is required, with screws 24" O.C. along center line and edges of each sheet - joints finished.

C. Screw Fastening:

1. Power drive all screws with an electric screwdriver until the screw head provides a slight depression below the surface of the wallboard, but no further. Do not break the paper covering in the board. If the paper surface is broken, place another screw approximately 2 inches from the damaged surface.

2. Screws shall be spaced a maximum of 8" O.C., and not closer than 3/8" to edges. Pair, not stagger, fasteners at edge joints between adjacent sheets.

3. Fastening for vertical and horizontal application shall begin at the top center of the panel and proceed outward to the edges or ends, with the top completed before proceeding. Fastening the field of the panel shall begin with the member nearest the center of the panel and proceed outward to the edges or ends, with the fastening completed on each member before proceeding to the next member.

D. Nail Fastening:

1. Where wallboard is required to be secured to wood furring member, installation shall be with annular nails. Nailing for vertical and horizontal application shall be as specified for screw fastening above, except with maximum (nail) spacings of 7" O.C. at ceilings, and 8" O.C. at walls.

2. Wallboard may also be secured to wood framing members and furring with screws, in which case, the application shall be as specified for screw fastening above, including maximum screw spacings.

3.07 EXPANSION JOINTS AND CONTROL JOINTS

A. Expansion Joints: Provide expansion joints where noted on the Drawings and/or required by field conditions. Provide two (2) metal casing beads, back to back, with open space of size detailed on Drawings between backs, at expansion joint centerlines.

B. Control Joints: Where not indicated on Drawings, gypsum panel surfaces shall be isolated with control joints where partition or furring run exceeds 30 ft.; where soffit/ceiling dimensions exceed 50 ft. in either direction, or area within separate soffit/ceiling sections exceeds 2,500 sq. ft.; where wings of “L”, “U”, and “T” shaped soffit/ceiling areas are joined; where soffits/ceilings abut partition or vertical surface; and where expansion or control joints occur in base exterior wall. Back joint by double studs or furring channels.

1. Where soffits/ceilings abut partitions or vertical surfaces, install dust stop gasket (with slight fullness to allow for movement of joint), then install soffit/ceiling wallboard with metal casing bead at exposed edge, forming a 1/8" to 1/4" wide open space between the abutting surfaces. Casing beads shall be flushed with wallboard in same manner as hereinafter specified for edge treatment.

2. Install at all other control joint locations, approved, roll-formed zinc control joints, attaching with Bostich® 9/16" “G” staples, or approved equal, spaced not over 6" apart. Cut end joints square and align for neat fit. Control joint shall then be given joint finishing treatment as hereinafter specified. Remove protective tape when joint treatment is completed.

3.08 SOUND-RATED CONSTRUCTION:

A. Insulation: Coordinate with Acoustic Insulation Contractor for installation of acoustic insulation in sound-rated partitions where indicated on the Drawings.

B. Gypsum Board:

1. Install gypsum board same as for interior partitions and ceilings.

2. Coordinate with installation of perimeter sealants.

3. After installation of gypsum board base layer(s), cut face layer sheets 1/2 inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction.

C. Sound Flanking Paths: Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.

3.09 CORNER AND EDGE TREATMENT

A. Internal Corners: Treat all exposed internal corners, as specified herein under Article for FINISHING. Reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.

B. External Corners: At external corners neatly fit a corner bead over the corner and secure with the same type screws used for applying wallboard. Space screws approximately 6 inches on centers, driving through the wallboard into the framing member. After the corner piece has been secured in place, treat the corner with joint cement and reinforcing tape in the manner as specified herein under Article for FINISHING. Feather final coat of topping compound out from 12 to 16 inches on both sides of corner.

C. Edges: Finish all exposed edges of wallboard, including perimeter of all soffit/ceiling areas, and edges abutting masonry, concrete, door frames, window frames, and other finish construction, with metal casing beads. Casing beads shall be flushed with wallboard surface in manner herein before specified for external corners, topping compound feathered out from 12 to 16 inches to surfaces of wallboard.
All Work shall be sanded smooth when dry.

3.10 FINISHING

A. Levels of Finish: Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA-214, “Recommended Levels of Gypsum Board Finish”.

1. Level 1: All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable.

a. Locations: Provide Level 1 finish for gypsum board surfaces in ceiling plenum areas and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.

2. Level 2: All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.

    a. Locations: Provide Level 2 finish for gypsum board substrate at tile and FRP panels, except remove tool marks and ridges.

3. Level 3: All joints and interior angles shall have tape embedded in joint compound and one (1) additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two (2) separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: The prepared surface shall be coated with a drywall primer by the Painting Contractor prior to the application of final finishes as specified in Division 09.

    a. Locations: Provide Level 3 finish for gypsum board surfaces, where heavy- or medium textured finishes or heavy-grade vinyl wallcovering will be used.

4. Level 4: All joints and interior angles shall have tape embedded in joint compound and two (2) separate coats of joint compound applied over all flat joints and one (1) separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three (3) separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Note: The prepared surface shall be coated with a drywall primer by the Painting Contractor prior to the application of final finishes as specified in Division 09.

    a. Locations: Provide Level 4 finish for gypsum board surfaces, where smooth flat paints, light textures, or light- or medium-grade wallcoverings are to be applied.

B. Interior Gypsum Board:

1. Prefill:

    a. Use setting-type joint compound. Mix joint compound according to manufacturer’s directions.

    b. Fill joints between boards flush to top of eased or beveled edge.

c. Wipe off excess compound and allow compound to harden.

2. Taping (Level 1):

a. Use taping or all purpose compound.

b. Butter taping compound into inside corners and joints.

c. Center tape over joints and press down into fresh compound.

d. Remove excess compound.

e. Tape joints of gypsum board above suspended ceilings.

3. First Coat (Level 2):

a. Use taping or all-purpose drying-type compound, or setting-type joint compound.

b. Immediately after bedding tape, apply a thin skim coat of joint compound trowel applied over body of tape and allow to dry completely in accordance with manufacturer's instructions.

c. Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.

4. Second Coat (Level 3): Use all purpose or topping drying type joint compound. After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 2 inches beyond edge of first coat.

5. Third Coat (Level 4):

a. Use all purpose or topping drying type joint compound.

b. After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2 inches beyond edge of second coat.

c. Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and make suitable and ready for
application of final finish by others.

C. Water-Resistant Gypsum Board: Treat fastener heads and joints with setting-type joint compound.

1. For joints to be covered with tile, apply tape and joint compound bedding coat and skim coat only; do not apply finish coats.
   a. Do not crown joints or leave excess compound on panels.
   b. Remove tool marks and ridges.
   c. For fastener heads to be covered with tile, apply one (1) coat of joint compound.

D. Joint Compound:

1. After skim coat sets, apply finish coat of compound feathering 3 to 4 inches beyond tape edges.
2. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.

E. Trim:

1. Use same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports, unless otherwise recommended by trim manufacturer.
2. Install metal corner beads at external corners.
3. Install metal casing bead trim whenever edge of gypsum base would otherwise be exposed or semi-exposed, and where gypsum base terminates against dissimilar material.

F. Control Joints: Install where indicated and specified.

G. Special Trim and Reveal Joints: Install as indicated on Drawings and in accordance with manufacturer’s instructions.

3.11 GYPSUM SHEATHING PANELS

A. Preparation: Examine exterior metal stud framing and verify that the surface of the framing members to receive the sheathing does not vary more than 1/4" from the plane of faces of adjacent members.

1. Inspection: Steel framing stud spacing shall not exceed 16 inches O.C. for 1/2 inch thick gypsum sheathing panels and 24 inches O.C. for 5/8 inch thick gypsum sheathing panels.
2. Notification: Contact the General Contractor, in writing, for correction, of any condition, detrimental to the installation of this Work.

B. Sheathing Installation: Provide sheathing where indicated on the Drawings and as specified herein. Install sheathing in accordance with ASTM Standard C1280 and the manufacturer's written installation instructions and recommendations.

1. Fiberglass-faced gypsum sheathing, where indicated on the Drawings, over metal stud framing shall be installed with the "gold side" out (exposed to exterior view/side).

    a. Fasteners shall be flush to the face of the board, not countersunk.

    b. Do not laminate sheathing to masonry surfaces.

3.12 SURFACE PREPARATION FOR PAINTING

A. Where painting of gypsum wallboard surface or vinyl wallcovering is indicated on the Drawings, tape, spackle and sand flush all surface imperfections, cracks, and gouges to make suitable for finish painting by the Painting Contractor.

3.13 CLEAN-UP

A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. During progress of the Work, upon completion of Work, and before final acceptance of the Work, remove all debris and rubbish to central area designated for clean-up by the General Contractor. Remove all unused materials, tools, and equipment from site.

B. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 09 30 00
TILING

PART 1 GENERAL

1.1 SCOPE:

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Thin-Set Tile Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following Tile and Accessories:

1. ColorBody Porcelain
2. Special Tile Shapes
3. Quarry
4. Ceramic Wall Tile
5. Trim and Accessories
6. Setting Materials, Accessories, and Sealants.

B. Color Selections: Refer to Color Legend on the Drawings.

C. Room Finish Schedule and Colors: Refer to the Drawings.

1.2 RELATED SECTIONS

Related Sections: The following Work will be provided under other sections of the Specifications:

1. Unit Structural Masonry - Section 04 23 00.
2. Rough Carpentry - Section 06 10 00.
3. Joint Protection - Section 07 90 00.
4. Joint Sealants- Section 07 92 00.
5. Aluminum Framed Entrances and Storefronts - Section 08 41 13.
6. Cementitious Backing Boards - Section 09 28 13.
7. Gypsum Wallboard - Section 09 29 00.
8. Resilient Bases and Accessories - Section 09 65 13.
9. Paints and Coatings - Section 09 90 01.

1.3 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Requirements of Regulatory Agencies: Furnish and install all Tile Work in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

B. References: Unless otherwise specified herein, all tile materials, installation, and workmanship shall conform to the following:

American National Standards Institute (ANSI):

a. A108.5 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex- Portland Cement Mortar.

b. A118.1 Specifications for Dry-Set Portland Cement Mortar.

c. A118.3 Specifications for Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.

1. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
2. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
3. ANSI A108.1C - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
4. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
5. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
6. ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
7. ANSI A108.8 - Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
8. ANSI A108.9 - Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
9. ANSI A108.10 - Specifications for Installation of Grout in Tilework.
10. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
11. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.

12. ANSI A118.4 - Latex-Portland Cement Mortar.
13. ANSI A118.5 - Chemical-Resistant Furan Mortar and Grout.
14. ANSI A118.6 - Standard Ceramic Tile Grouts.
15. ANSI A118.7 - Polymer Modified Cement Grouts
16. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
17. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units.
18. ANSI A118.10 - Load bearing, Bonded, Waterproof Membranes for Thinset Ceramic Tile and Dimensional Stone.
19. ANSI A118.11 - Exterior Grade Plywood (EGP) Latex-Portland Cement Mortar.
20. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.
21. ANSI A137.1 - Specifications for Ceramic Tile.

C. ASTM International (ASTM):
1. ASTM C 50 - Standard Practice for Sampling, Sample Preparation, Packaging, and Marking of Lime and Limestone Products.
2. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
3. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C 241 - Standard Test Method For Abrasion Resistance of Stone Subjected to Foot Traffic.
5. ASTM C 503 - Standard Specification for Marble Dimension Stone.
6. ASTM C 615 - Standard Specification for Granite Dimension Stone.
7. ASTM C 629 - Standard Specification for Slate Dimension Stone.
8. ASTM C 847 - Standard Specification for Metal Lath.
9. ASTM C 1028 - Standard Test method for Determining the Static Coefficient of Friction or Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull meter Method.
10. ASTM D 4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

D. Tile Council of North America (TCNA): TCA Handbook for Ceramic Tile Installation, 2007.

E. Codes and Ordinances: Where requirements of governing Federal, Local and/or State Codes and Ordinances are more stringent than the requirements specified herein, the requirements of such Codes and Ordinances shall govern, as applicable.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: Tile on walkway surfaces shall be provided with the following values as determined by testing in conformance with ASTM C 1028.
1. Level Surfaces: Minimum of 0.6 (Wet).
2. Step Treads: Minimum of 0.6 (Wet).
3. Ramp Surfaces: Minimum of 0.8 (Wet).

1.5 SUBMITTALS

A. General: Submit Samples, Product Data, and Certificates to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

1. Mark each tile and/or marble Sample legibly, with the Identity of the Sample, the Name of the Installer, the Name of the Project, and the Location in the Building.

B. Submit under provisions of Section 01 30 00 - Administrative Requirements.

C. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations. For information only, submit two (2) copies of manufacturer’s technical information and installation instructions for all materials required, except bulk materials.
2. Storage and handling requirements and recommendations.
3. Installation methods.

D. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

E. Selection Samples: Submit two (2) full size actual tile Samples of each type (including special shapes) and colors of tile, and provide letters of intent to the Architect, for review and approval prior to starting the Work for selection.

F. Samples: Mount tile and apply grout on two plywood panels, illustrating pattern, color variations, and grout joint size variations.
Marble Threshold Samples: Submit two (2) Samples not less than 3" x 5", of marble in thickness required.

G. Quartz Countertop Samples: Submit two (2) Samples not less than 6" x 6", of granite in thickness required.

H. Sealant Samples: Submit Samples of sealant for review and approval by the Architect. Do not commence Work until the Architect’s written approval of the Samples has been received.

1. Submit two (2) Samples of each color required for each sealant exposed to view. Install Sample between two (2) Samples of tile and/or marble material representative of typical joint widths.
Manufacturer’s color charts and/or color swatches will not be acceptable as Samples.

I. Grouting Mortar Samples: Submit two (2) Samples of each color required for review and approval by the Architect. Do not commence Work until written approval from the Architect has been received.

J. Metal Edge Trim Strip Samples: Submit two (2) 12" long Samples of metal edge trim angle strip for Architect's review and approval.

K. Manufacturer's Certificate: Before proceeding with the Tile Work, furnish the Architect with a Master Grade Certificate, in the form shown in the TCNA Al37.l signed by the manufacturer and the Contractor certifying the grade, type, and quantity of each kind of tile, together with adequate information for identification of the containers to which they apply.

1. Certify that products meet or exceed specified requirements.
2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.

L. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. General: Contractor for Tile Work shall be responsible for an acceptable completed installation for areas designated to be tiled. Work shall be in complete conformity to the type of tile, dimensions, colors, grades, patterns, and necessary trim units as shown on Drawings and/or required by field conditions.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years' of proven successful experience satisfactory to the Architect and/or Owner. Work shall be performed by qualified workmen in a manner conforming to best current practice of the trade.

C. Performance Requirements: Tiles and countertops shall be new materials conforming to performance requirements as specified herein. Materials of "second" quality not meeting or exceeding the requirements of these Specifications shall not be accepted.

D. Material Shelf Life: Do not retain setting and sealant materials at the jobsite which have exceeded the shelf life recommended by the manufacturer.

E. Tile Mock-Ups: Prior to installation Work, lay-out in the building, full-size mock-ups of each tile pattern to be used in the Work.

1. Sample areas shall be prepared in the building where and as directed by the Architect and/or Owner's Supervising Engineer.

2. Size of Sample area shall be as designated by the Architect.

3. Remove tile mock-up as directed by Architect.

F. Visual Approvals: Obtain Architect and/or Owner's Supervising Engineer acceptance of visual qualities of the Work during progress of the Work before proceeding with the Work.

G. Single Source Responsibility: Obtain each type and color of tile from a single source. Obtain each type and color of mortar, adhesive and grout from the same source.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in original, unopened containers, branded or labeled with the proper grade seal. Mark all containers with designations corresponding with information given on the grade certificates. The containers shall be subject to inspection by the Architect before being opened, as well as during the progress of the Work.

B. Protect adhesives and liquid additives from freezing or overheating in accordance with manufacturer's instructions.

C. Store tile. Protect materials, and setting materials within waterproof enclosures to prevent water absorption and on elevated platforms, under cover and in a dry location and protect from contamination, dampness, freezing or overheating. Handle materials to prevent damage.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during tiling and for a minimum of 7 days after completion.

C. Schedule installation of tile with the Owner’s Representative to assure completion of all Tile Work, including all protective measures, prior to receipt and installation of Tenant and/or Owner supplied fixtures, equipment, furnishings, etc.

D. When installing tiles and marble over new concrete slabs, do not start installation until concrete has cured for at least five (5) days and then aged for fourteen (14) additional days, or for such additional time as required for the concrete to have shrunk and attained equilibrium.

E. Install tiles when ambient air temperatures, and temperatures of all materials, is 55°F. or higher. Rooms or areas in which Work is to be installed shall be at temperatures of 55°F. or higher twenty-four (24) hours prior to installation to at least five (5) days after completion of installation. Refer to Division 0 “Supplementary Conditions” for description of temporary heat.

1.9 EXTRA MATERIALS

A. General: Not less than 30 days prior to opening of the facility, deliver to the Owner's Representative, the following materials for future use. Materials shall be delivered with a list of manufacturer's names, product designations, addresses, and phone numbers. Materials shall be boxed, sealed, and clearly identified as to product and specific location of use. Furnish the following quantities of material for use within the designated area.

1. Provide for Owner's use a minimum of 2 percent of the primary sizes and colors of tile specified, boxed and clearly labeled.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tile Manufacturer:
1. As specified in drawings.

B. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

C. Tile Products: Provide tile products of manufacturers, product lines, colors and sizes as noted on the Drawings.

D. Tile Installation Products:

1. Mapei setting and grouting materials as specified herein shall establish the commercial standard of quality and performance required. Mapei® tile installation products as manufactured by Mapei Corporation, 1144 East Newport Center Drive, Deerfield Beach, FL 33442, (954)246-8888 or (800)426-2734; www.mapei.com, will be acceptable, and subject to review by the Architect

2.2 TILE

A. General: Provide tile that complies with ANSI A137.1 for types, compositions and other characteristics indicated. Provide tile in the locations and of the types colors and pattern indicated on the Drawings and identified in the Schedule and the end of this Section. Tile shall also be provided in accordance with the following:
1. Factory Blending: For tile exhibiting color variations within the ranges selected under Submittal of samples, blend tile in the factory and package so tile taken from one package shows the same range of colors as those taken from other packages.
2. Mounting: For factory mounted tile, provide back or edge mounted tile assemblies as standard with the manufacturer, unless otherwise specified.
3. Factory Applied Temporary Protective Coatings: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by pre-coating with a continuous film of petroleum paraffin wax applied hot. Do not coat unexposed tile surfaces.

B. Porcelain Tile: PT-1
1. Product: Keystones.
2. Moisture Absorption: Less than .5 percent to less than 20 percent.

3. Size and Shape: 2 inches square, nominal.
4. Surface Finish: Unpolished.
5. Colors: As scheduled.
6. Pattern: As indicated on the Drawings.
7. Trim Units: Matching bullnose, cove base corner, cove base outcorner, jolly, grooved bullnose, cement bullnose, fabric bullnose, shapes in sizes coordinated with field tile.

C. Wall Tile: CT-1, CT-2, CT-3, CT-4, CT-5, CTB-1
1. Product: Color Wheel.
2. Size and Shape: 3 inches by 6 inches, nominal.
3. Surface Finish: Polished.
4. Colors: As scheduled.
5. Trim Units: Cement Bullnose, Cove Base, Cove Base Corner, Fabric Bullnose, Groover Bullnose, Jolly shapes in sizes coordinated with field tile shapes.

2.3 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.
1. Soap Dish: With wash cloth holder, clam shell design, surface mounted or recessed; cast strength sufficient to resist lateral pull force of 75 lbs (34 Kg).
2. Toilet Tissue Holder: Surface mounted or recessed, for single roll, with spring loaded holder.
3. Towel Bars: Standard design, surface mounted with extensions for casting into small wall openings; cast strength sufficient to resist lateral pull force of 30 lbs. (14 Kg).

4. Corner Shelf.

2.4 SETTING MATERIALS

A. Organic Adhesive: ANSI A136.1, thin set bond type; use Type I in areas subject to prolonged moisture exposure.

B. Epoxy Adhesive: ANSI A118.3, thin set bond type.

C. Mortar Bed Materials:
1. Portland cement: ASTM C150, type 1, gray or white.
2. Hydrated Lime: ASTM C207, Type S.
3. Sand: ASTM C144, fine.
4. Latex additive: As approved.
5. Water: Clean and potable.

D. Mortar Bond Coat Materials:
1. Dry-Set Portland Cement type: ANSI A118.1.
2. Latex-Portland Cement type: ANSI A118.4.
3. Epoxy: ANSI A118.3, 100 percent solids.

E. Standard Grout: Cement grout, sanded or unsanded, as specified in ANSI A118.6; color as selected.

F. Polymer modified cement grout, sanded or unsanded, as specified in ANSI A118.7; color as selected.

G. Epoxy Grout: ANSI A118.8, 100 percent solids epoxy grout; color as selected.

H. Silicone Sealant: Silicone sealant, moisture and mildew resistant type, white; use for shower floors and shower walls.

I. Cleavage Membrane:
1. No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type 1.
2. Polyethylene film, ASTM D4397, 4.0 mil thickness.

J. Waterproofing Membrane at Floors: Membrane in accordance with ANSI A118.10 and as follows:
1. Chlorinated Polyethylene Sheet with polyester fabric reinforcing.
2. Fabric Reinforced, Fluid-Applied elastomeric membrane.
3. Un-Reinforced, Fluid-Applied elastomeric membrane.
4. Polyethylene Sheet Product.
5. Fabric-Reinforced, Modified-Bituminous Sheet Product.
6. Urethane Waterproofing and Tile-Setting Adhesive Product.

K. Membrane at Walls: No. 15 (6.9 kg) asphalt saturated felt, ASTM D226, Type 1.

L. Membrane at Walls: 4 mil (0.1 mm) thick polyethylene film, ASTM D4397.

M. Membrane at Walls: Reinforced asphalt paper.

N. Reinforcing Mesh: 2 by 2 inch (50 by 50 mm) size weave of 16/16 wire size; welded fabric, galvanized.

O. Metal Lath: ASTM C847, Flat expanded diamond mesh, not less than 2.5 lbs/SY, galvanized finish.

P. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:
1. Thickness: 1/4 inch (6 mm).
2. Thickness: 1/2 inch (13 mm).
3. Thickness: 5/8 inch (16 mm).

Q. Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.

R. Epoxy Adhesive: Latapoxy® 310 Stone Adhesive, two-component, non-sag, high strength construction epoxy adhesive, meeting and exceeding ANSI A 118.3.

1. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2.5 SPECIAL SHAPES

A. General: Provide special shapes, such as wall base materials, trim pieces, interior cove, corner bullnose, and exterior/interior corner units, to be used in their respective

places as required by the Drawings and/or field conditions.

2.6 METAL EDGE TRIM STRIPS

A. Manufacturer: Schluter Systems L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841, (800)472-4588; www.schluter.com, or comparable equivalent manufacturer's product subject to review by the Architect.

B. Product: Edge-protection trim as indicated on the Drawings and/or required by field conditions.

2.7 SEALANTS

A. Floor Joint Sealant: Dynatred®, Non-Sag, Traffic-Grade Polyurethane Sealant, two-part, chemically curing, cold-applied elastomeric sealant, conforming to Federal Specification TT-S-00227E, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (215)723-6051 or (800)523-6688.

1. Primer: As recommended by the specified sealant manufacturer.

2. Colors: Sealant color shall match grout joint colors, and shall be subject to review and approval by the Architect and/or Owner.

3. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

PART 3 EXECUTION

3.01 EXAMINATION

A. Surface Inspections: Carefully inspect all surfaces upon which materials will be applied, and report to the General Contractor in writing, any condition detrimental to the installation, for correction prior to proceeding with the Work. The installation of Tile Work will be considered an acceptance of the surfaces to be covered, and claims for failure of Tile and Countertop Work because of unsatisfactory sub-surfaces will not be allowed within tolerances specified in ANSI A137.1, and are ready to receive tile.

B. Verify that sub-floor surfaces are dust-free, and free of substances which would impair bonding of setting materials to sub-floor surfaces, and are smooth and flat within tolerances specified in ANSI A137.1.

C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

E. Concrete Floor Slab Tolerance Flatness/Levelness: Floor shall comply with ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and FL Floor Levelness Numbers; using the F-Number System.

1. If concrete floor slab surfaces exceed the maximum variation, Tile Contractor shall notify the General Contractor for correction of any defects. Starting Work shall imply acceptance of the job conditions, and an unsatisfactory surface condition for the installation of the materials will not be considered valid in waiving any portion of the warranty.

3.02 PREPARATION

F. Prepare all surfaces upon which materials will be applied as required to receive Work. Remove all dirt, grease, oil, paint, and other surface contaminations that will prevent proper bonding from the substrate surfaces. Remove all ridges, fins, projections, high spots and other irregularities that would interfere with proper installation Work.

G. Protect surrounding work from damage.

H. Remove any curing compounds or other contaminates.

I. Vacuum clean surfaces and damp clean.

J. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

K. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.

L. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1 through A108.13, manufacturer's instructions, and TCA Handbook recommendations.

B. Lay tile to pattern indicated. Arrange pattern so that a full tile or joint is centered on each wall and that no tile less than 1/2 width is used. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Install thresholds where indicated.

I. Sound tile after setting. Replace hollow sounding units.

J. Keep expansion joints free of adhesive or grout. Apply sealant to joints.

K. Allow tile to set for a minimum of 48 hours prior to grouting.

L. Grout tile joints. Use standard grout unless otherwise indicated.

M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

N. Locate cuts to be inconspicuous.

O. Align all floor joints to have straight, uniform grout lines parallel with adjacent walls and surfaces.

P. Whenever possible, align grout joints of wall tile and base tile with floor tile joints.

Q. Neatly cut and accurately fit all Tile Work around piping and other installations which pierce the Tile Work; at irregular shaped places; and at the junction with other materials. The surface of the tile shall not be chipped or otherwise be damaged in cutting. Grind cut edges smooth and even.

3.04 WORKMANSHIP AND APPLICATION

A. General: Install tile as indicated on the Drawings and specified herein.

1. Select tile from the same shade and lot number.

2. Visually inspect the tile prior to installation.

3. Mix tiles from several boxes.

4. Rotate the tiles to ensure a non-repeat look.

B. Installations: Work shall be performed according to industry standards, manufacturer’s written specifications, and reference standards.

C. Porcelain Ceramic Floor Tile Applications - Thin Bed (Thin Set) Method:

1. Mixing requirements as per Mapei product requirements.

a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Apply the mortar with the flat side of the trowel, being sure to work the material into the surface of the concrete substrate. Comb the surface of the mortar with the notched side of the trowel. Use the proper size notched trowel for the size of tile to be installed.

3. Before placing tiles into the fresh mortar, wipe the back of each tile with a damp sponge or “Scotch Brite™” pad, to remove any dirt or dusty release agents on the tile backs to enhance the bonding strength.

4. Apply mortar to the back of the cleaned tiles to completely cover the back of the tile with a minimum 3/32" to 1/8" uniform thickness.

5. Place the tiles while the mortar is wet and tacky and beat the tile with a rubber mallet and beating block to firmly bed the tiles into the mortar. Occasionally lift a tile off the mortar bed to check for proper coverage of the mortar. Before hardening, excess mortar shall be cleaned with a damp sponge. Tiles may then be grouted when firmly set.

6. Grouting: Provide stain resistant, colorfast, epoxy grout “Mapei”. Exposed joint widths based on manufacturer's tiles as specified herein shall be typically 1/4" wide for nominal 6" x 6" tiles and 5/16" wide for nominal 12" x 12" tiles. Note:
Joint widths for use with other manufacturer’s products shall be verified with the Architect.

   a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).
   b. Preparation: Before starting to grout, remove debris in grout joints and lightly sponge the tile surface to remove all dust and dirt. Water shall not be left standing in joints.

   c. Installation Method:

7. Empty entire contents of packed liquid premeasured kit product jars into a clean pail/container using a clean mixing stick or margin trowel. Mix thoroughly for one minute. Add at least 3/4 of powder product, using more powder for wider joints, as recommended by the manufacturer.

8. Immediately pour entire content of pail/container onto working area. Use standard epoxy grouting techniques to work grout into grout joints. Insure that all grout joints are fully packed.

9. Clean-up by using a hard epoxy rubber grout float at 90° angle to remove as much excess material as possible before initial cleaning with nylon scrub pad. Do not leave excess grout on the face of tiles.

10. Wash the installation within 12 to 24 hours after grouting using a detergent solution such as “Spic n Span®”, Trisodium Phosphate, “Ajax®”, “Comet®”, or non-abrasive cleaner to remove any haze or residue. Do not allow grout film to remain on surface for more than 24 hours.

D. Metal Edge Trim Strips: Verify in field, height dimension of trim product in relation to thickness of the tile and/or mortar bed, and report to the General Contractor, in writing, any discrepancy detrimental to the proper installation of the product. Install specified metal edge trim angles where shown, and as detailed on the Drawings.

1. Installation: Press the perforated anchoring leg of the trim strip into the tile adhesive and align.
Trowel tile adhesive over the anchoring leg. Surface of the tile shall level with the top of the trim (the trim shall not be higher than the surface of tile, rather slightly lower – approximately 1/32"). The joint between the tile and the trim (approximately 1/32" - 1/8") shall be filled completely with grout.

E. Floor Joint Sealant: Provide control joints in floor Work where Tile Work abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes and where changes occur in backing materials as detailed on the Drawings and/or required by field conditions.

3.05 MARBLE THRESHOLD INSTALLATIONS

A. Install thresholds in white dry set mortar (with latex system) similar to setting of floor tile, and point joints between marble and tile flush.

3.06 COUNTERTOP INSTALLATION

A. Adhesive Applications: Provide Epoxy Adhesive product as specified herein for installation of granite on substrate, as indicated on the Drawings.

1. Preparation:

a. Before using, store resins at room temperature (70°F+21°C+) for 24 hours to ensure ease of mixing. All surfaces must be sound, clean, free of oil, waxes, or other bond inhibiting contaminants.

b. Clean and grind back of granite at areas to receive the Epoxy Adhesive spots using a mechanical wheel grinder with a diamond wheel/blade. Remove dust with a stiff brush, wipe entire surface. Using a damp sponge (not wet), wipe the granite to remove any particles or remaining dust to ensure a clean direct bond and that all ground material is removed. Wipe dry with a clean cloth, then apply Epoxy Adhesive. NOTE: Epoxy Adhesive should not be applied to saturated or wet
granite. If wetness or dampness is observed inside the granite after grinding off the top layer, the granite is saturated and must be allowed to dry out.

2. Mixing: Combine equal volumes of Epoxy Adhesive Part A and Part B (1:1 mix ratio by volume). Mix until uniform in color; no swirls. Small quantities may be mixed with a putty knife or margin trowel. Larger quantities may be mixed with an electric drill mixer (low speed).

3. Application:

a. Apply dabs evenly distributed on back of the granite as recommended by manufacturer. Finished dab thickness must be a minimum of 1/8" (3mm).

b. After installation of Epoxy Adhesive onto the substrate, install onto substrate and adjust for plumb and level.

4. Cleaning: Clean tools and Work while epoxy is fresh, using warm water. Detergent or soap may be added to the water for easier cleaning.

3.07 IMPERFECT TILE WORK

A. When directed by the Architect and prior to final acceptance of the Work, remove all broken, chipped, loose or otherwise unsatisfactory installed Tile and Countertop Work.

B. Patch and restore imperfect tile materials and workmanship to good condition satisfactory to the Architect and/or Owner.

3.08 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F113, dry-set or latex-portland cement bond coat, with standard grout,

unless otherwise indicated.

1. Where waterproofing membrane is indicated, install in accordance with TCA Handbook Method F122, with latex-portland cement grout.
2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131.

3.09 INSTALLATION - FLOORS - MORTAR BED METHODS

A. Over interior concrete substrates, install in accordance with TCA Handbook Method F111, with cleavage membrane, unless otherwise indicated.

1. Where waterproofing membrane is indicated, with standard grout or no mention of grout type, install in accordance with TCA Handbook Method F121.

2. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F132, bonded.

3. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCA Handbook Method F114, with cleavage membrane.

B. Cleavage Membrane: Lap edges and ends.

C. Waterproofing Membrane: Install as specified in ANSI A108.13.

D. Mortar Bed Thickness: 1-1/4 to 2 inch (32 to 51 mm) maximum, unless otherwise indicated.

3.10 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordancewith TCA Handbook Method W244, using membrane at toilet rooms.

B. Over cementitious backer units install in accordance with TCA Handbook Method W223, organic adhesive.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCA Handbook Method W243, thin-set with dry-set or latex-portland cement bond coat, unless otherwise indicated.
1. Where mortar bed is indicated, install in accordance with TCA Handbook Method W222, one coat method.
2. Where waterproofing membrane is indicated other than at showers and bathtub walls, install in accordance with TCA Handbook Method W222, one coat method.

D. Over interior concrete and masonry install in accordance with TCA Handbook Method W202, thin-set with dry-set or latex-portland cement bond coat.

E. Over wood studs without backer install in accordance with TCA Handbook Method W231, mortar bed, with membrane where indicated.

F. Over metal studs without backer install in accordance with TCA Handbook Method W241, mortar bed, with membrane where indicated.

3.11 CLEANING

A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. Remove all debris and rubbish from the site. Upon completion and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

B. When directed by the Architect, after the Work of other trades is substantially completed, remove and dispose of protective coverings and thoroughly clean all Work installed under this section. Use of acid will not be permitted. Use clean water in initial cleaning. Remove all stains, excessive mortar, etc.

C. Cleaner shall be a neutral, general, all-purpose cleaner free of acids, alkalies and abrasives such as one of the following:

1. Mira Clean #1 by Miracle Sealants Company, 12318 Lower Azusa Road, Arcadia, CA 91006-5872, (800)350-1901 or (626)443-6433.

a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Super Shine-All® by Hillyard, Inc., 302 North 4th. Street, P.O. Box 909, St. Joseph, MO, 64501, (816)233-1321 or (800)365-1555.

a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

D. Waste Management: Collect field generated construction waste created during construction or final cleaning.

E. Clean tile and grout surfaces.

3.12 PROTECTION OF FINISHED WORK

A. Do not permit traffic over finished floor surface for 72 hours after installation.

B. Cover floors with kraft paper and protect from dirt and residue from other trades.

C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways.

D. Properly protect all finished Work from damage that is in place at the time this Work is being done. Tile Contractor shall be responsible and will be required to pay for all damage to other Work caused by the Contractor’s workmen.

E. Protective covering shall be non-staining multi-purpose building paper with compatible seam tape. Product shall be such as “SealTight® Red Rosin Paper” as manufactured by W.R. Meadows, Inc., 300 Industrial Drive, P.O. Box 338, Hampshire, IL 60140-0338, (800)342-5976, (847)214-2100; www.wrmeadows.com, or comparable equivalent product subject to review by the Architect.

3.13 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner’s acceptance of the installation.

B. Systems Guarantee: Obtain from the setting materials manufacturer, a written Systems Guarantee, guaranteeing that the products specified herein shall be free from manufacturing defects and will not break down or deteriorate for a period of not less than five (5) years from the date of the installation, when installed in accordance with the manufacturer’s written specifications and guidelines.

3.14 SCHEDULE

A. Floor Tile:
As indicated on the Drawings.

B. Wall Tile:
As indicated on the Drawings.

END OF SECTION

SECTION 09 31 00
THIN-SET TILE WORK

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Thin-Set Tile Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Porcelain Ceramic Floor and Wall Tiles.

2. Special Tile Shapes.

3. Setting Materials, Accessories, and Sealants.

B. Room Finish Schedule and Colors: Refer to the Drawings.

C. Related Sections: The following Work will be provided under other sections of the Specifications:

1. Cast In Place Concrete - Section 03 30 00.

2. Unit Structural Masonry - Section 04 23 00.

3. Rough Carpentry - Section 06 10 00.

4. Joint Protection - Section 07 90 00.

5. Glass, Glazing, and Aluminum Work - Section 08 41 00.

6. Gypsum Wallboard - Section 09 29 00.

7. Resilient Bases and Accessories - Section 09 65 13.

8. Resilient Tile Flooring - Section 09 65 19.

9. Paints and Coatings - Section 09 90 00.

10. Toilet Compartments - Section 10 21 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Requirements of Regulatory Agencies: Furnish and install all Tile Work in strict compliance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336.

B. References: Unless otherwise specified herein, all tile materials, installation, and workmanship shall conform to the following:

1. American National Standards Institute (ANSI):

a. A108.5 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex- Portland Cement Mortar.

b. A118.1 Specifications for Dry-Set Portland Cement Mortar.

c. A118.3 Specifications for Chemical-Resistant, Water-Cleanable Tile-Setting and Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.

2. Tile Council of North America, Inc. (TCNA): Amercian National Standards Specifications for Ceramic Tile - ANSI 137.1, current edition.

C. Codes and Ordinances: Where requirements of governing Federal, Local and/or State Codes and Ordinances are more stringent than the requirements specified herein, the requirements of such Codes and Ordinances shall govern, as applicable.

1.03 QUALITY ASSURANCE

A. General: Contractor for Tile Work shall be responsible for an acceptable completed installation for areas designated to be tiled. Work shall be in complete conformity to the type of tile, dimensions, colors, grades, patterns, and necessary trim units as shown on Drawings and/or required by field conditions.

B. Installer: Firm shall have specialized in Tile and Countertop Work for a period of not less than five (5) years of proven successful experience satisfactory to the Architect and/or Owner. Work shall be performed by qualified workmen in a manner conforming to best current practice of the trade.

C. Performance Requirements: Tiles and countertops shall be new materials conforming to performance requirements as specified herein. Materials of “second” quality not meeting or exceeding the requirements of these Specifications shall not be accepted.

D. Material Shelf Life: Do not retain setting and sealant materials at the jobsite which have exceeded the shelf life recommended by the manufacturer.

E. Tile Mock-Ups: Prior to installation Work, lay-out in the building, full-size mock-ups of each tile pattern to be used in the Work.

1. Sample areas shall be prepared in the building where and as directed by the Architect and/or Owner's Supervising Engineer.

2. Size of Sample area shall be as designated by the Architect.

3. Remove tile mock-up as directed by Architect.

F. Visual Approvals: Obtain Architect and/or Owner's Supervising Engineer acceptance of visual qualities of the Work during progress of the Work before proceeding with the Work.

1.04 SUBMITTALS

A. General: Submit Samples, Product Data, and Certificates to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

1. Mark each tile and/or marble Sample legibly, with the Identity of the Sample, the Name of the Installer, the Name of the Project, and the Location in the Building.

B. Tile Samples: Submit two (2) full size Samples of each type (including special shapes) and colors of tile, and provide letters of intent to the Architect, for review and approval prior to starting the Work.

C. Marble Threshold Samples: Submit two (2) Samples not less than 3" x 5", of marble in thickness required.

D. Granite Countertop Samples: Submit two (2) Samples not less than 6" x 6", of granite in thickness required.

E. Sealant Samples: Submit Samples of sealant for review and approval by the Architect. Do not commence Work until the Architect's written approval of the Samples has been received.

1. Submit two (2) Samples of each color required for each sealant exposed to view. Install Sample between two (2) Samples of tile and/or marble material representative of typical joint widths.
Manufacturer's color charts and/or color swatches will not be acceptable as Samples.

F. Grouting Mortar Samples: Submit two (2) Samples of each color required for review and approval by the Architect. Do not commence Work until written approval from the Architect has been received.

G. Metal Edge Trim Strip Samples: Submit two (2) 12" long Samples of metal edge trim angle strip for Architect's review and approval.

H**.** Product Data: For information only, submit two (2) copies of manufacturer's technical information and installation instructions for all materials required, except bulk materials.

I. Certificates: Before proceeding with the Tile Work, furnish the Architect with a Master Grade Certificate, in the form shown in the TCNA Al37.l signed by the manufacturer and the Contractor certifying the grade, type, and quantity of each kind of tile, together with adequate information for identification of the containers to which they apply.

1.05 PRODUCT DELIVERY

A. Delivery: Deliver all products in original, unopened containers, branded or labeled with the proper grade seal. Mark all containers with designations corresponding with information given on the grade certificates. The containers shall be subject to inspection by the Architect before being opened, as well as during the progress of the Work.

B. Storage: Store and protect materials within waterproof enclosures to prevent water absorption. Handle materials to prevent damage.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 PROJECT CONDITIONS

A. Schedule installation of tile with the Owner's Representative to assure completion of all Tile Work, including all protective measures, prior to receipt and installation of Tenant and/or Owner supplied fixtures, equipment, furnishings, etc.

B. When installing tiles and marble over new concrete slabs, do not start installation until concrete has cured for at least five (5) days and then aged for fourteen (14) additional days, or for such additional time as required for the concrete to have shrunk and attained equilibrium.

C. Install tiles when ambient air temperatures, and temperatures of all materials, is 55°F. or higher. Rooms or areas in which Work is to be installed shall be at temperatures of 55°F. or higher twenty-four (24) hours prior to installation to at least five (5) days after completion of installation. Refer to Division 0 "Supplementary Conditions" for description of temporary heat.

1.07 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance of the installation.

B. Systems Guarantee: Obtain from the setting materials manufacturer, a written Systems Guarantee, guaranteeing that the products specified herein shall be free from manufacturing defects and will not break down or deteriorate for a period of not less than five (5) years from the date of the installation, when installed in accordance with the manufacturer's written specifications and guidelines.

1.08 EXTRA MATERIAL

A. General: Not less than 30 days prior to opening of the facility, deliver to the Owner's Representative, the following materials for future use. Materials shall be delivered with a list of manufacturer's names, product designations, addresses, and phone numbers. Materials shall be boxed, sealed, and clearly identified as to product and specific location of use. Furnish the following quantities of material for use within the designated area.

1. 1% of the total of each color, size, and shape of the tile used, including bases.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Tile Manufacturer:

1. Daltile Commercial, SUNNYVALE, TX (972) 203-0200. Regular mail 199 Planters Rd Sunnyvale, TX 75182. www.daltile.com

B. Tile Products: Provide tile products of manufacturers, product lines, colors and sizes as noted on the Drawings.

C. Tile Installation Products:

1. Mapei setting and grouting materials as specified herein shall establish the commercial standard of quality and performance required. Mapei® tile installation products as manufactured by Mapei Corporation, 1144 East Newport Center Drive, Deerfield Beach, FL 33442, (954)246-8888 or (800)426-2734; www.mapei.com, will be acceptable, and subject to review by the Architect.

2.03 SPECIAL SHAPES

A. General: Provide special shapes, such as wall base materials, trim pieces, interior cove, corner bullnose, and exterior/interior corner units, to be used in their respective places as required by the Drawings and/or field conditions.

2.04 SETTING MATERIALS

A. Portland Cement Mortar: Unless otherwise specified, tile setting materials shall be LEED Approved products, as manufactured by Mapei Corporation, 1144 East Newport Center Drive, Deerfield Beach, FL 33442, (954)246-8888 or (800)426-2734; www.mapei.com. Materials shall be products licensed by the Tile Council of America, and bear TCA triangular hallmark on containers.

1. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

B. Grouting Mortar: Mortar for the various applications shall be as specified herein.

1. Wall Grout shall be MAPEI, Ultra Color Plus, 38 Avalanche, 3/16” thick, unless otherwise noted in the Construction Documents. Verify with Architect if discrepancies arise.

2. Floor Grout shall be MAPEI, Ultra Color Plus, 01 Pewtwer, 3/16” thick, unless otherwise noted in the Construction Documents. Verify with Architect if discrepancies arise.

3. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

C. Sand: Conform to ASTM Standard C144, clean, washed, sharp durable, uncoated aggregate free from all deleterious substances; uniformly graded from coarse to fine with 100% passing a No. 30 mesh screen and not more than 5% passing a No. 100 mesh screen.

D. Water: Potable water (suitable for drinking) shall be clean, free from oils, alkalies, acids, organic water, or other deleterious materials.

E. Epoxy Adhesive: Latapoxy® 310 Stone Adhesive, two-component, non-sag, high strength construction epoxy adhesive, meeting and exceeding ANSI A 118.3.

1. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2.05 METAL EDGE TRIM STRIPS

A. Manufacturer: Schluter Systems L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841, (800)472-4588; www.schluter.com, or comparable equivalent manufacturer's product subject to review by the Architect.

B. Product: Edge-protection trim "Schluter®-Schiene-A", mill-finished aluminum material, sizes as indicated on the Drawings and/or required by field conditions. Exposed finish surface width of the edge trim shall be not less than 1/8". Wall thickness for the perforated installation leg shall be 0.039" or 1mm.

2.06 SEALANTS

A. Floor Joint Sealant: Dynatred®, Non-Sag, Traffic-Grade Polyurethane Sealant, two-part, chemicallycuring, cold-applied elastomeric sealant, conforming to Federal Specification TT-S-00227E, as manufactured by Pecora Corporation, 165 Wambold Road, Harleysville, PA 19438, (215)723-6051 or (800)523-6688.

1. Primer: As recommended by the specified sealant manufacturer.

2. Colors: Sealant color shall match grout joint colors, and shall be subject to review and approval by the Architect and/or Owner.

3. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 250 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

PART 3 - EXECUTION

3.01 INSPECTION

A. Surface Inspections: Carefully inspect all surfaces upon which materials will be applied, and report to the General Contractor in writing, any condition detrimental to the installation, for correction prior to proceeding with the Work. The installation of Tile Work will be considered an acceptance of the surfaces to be covered, and claims for failure of Tile and Countertop Work because of unsatisfactory sub-surfaces will not be allowed.

B. Concrete Floor Slab Tolerance Flatness/Levelness: Floor shall comply with ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and FL Floor Levelness Numbers; using the F-Number System.

1. If concrete floor slab surfaces exceed the maximum variation, Tile Contractor shall notify the General Contractor for correction of any defects. Starting Work shall imply acceptance of the job conditions, and an unsatisfactory surface condition for the installation of the materials will not be considered valid in waiving any portion of the warranty.

3.02 PREPARATION

A. Prepare all surfaces upon which materials will be applied as required to receive Work. Remove all dirt, grease, oil, paint, and other surface contaminations that will prevent proper bonding from the substrate surfaces. Remove all ridges, fins, projections, high spots and other irregularities that would interfere with proper installation Work.

3.03 LAYOUT, CUTTING, AND FITTING

A. Layout all Tile Work to minimize cuts of less than one-half tile in size.

B. Locate cuts to be inconspicuous.

C. Align all floor joints to have straight, uniform grout lines parallel with adjacent walls and surfaces.

D. Whenever possible, align grout joints of wall tile and base tile with floor tile joints.

E. Neatly cut and accurately fit all Tile Work around piping and other installations which pierce the Tile Work; at irregular shaped places; and at the junction with other materials. The surface of the tile shall not be chipped or otherwise be damaged in cutting. Grind cut edges smooth and even.

3.04 WORKMANSHIP AND APPLICATION

A. General: Install tile as indicated on the Drawings and specified herein.

1. Select tile from the same shade and lot number.

2. Visually inspect the tile prior to installation.

3. Mix tiles from several boxes.

4. Rotate the tiles to ensure a non-repeat look.

B. Installations: Work shall be performed according to industry standards, manufacturer’s written specifications, and reference standards.

C. Porcelain Ceramic Floor Tile Applications - Thin Bed (Thin Set) Method:

1. Mixing requirements as per Mapei product requirements.

    a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Apply the mortar with the flat side of the trowel, being sure to work the material into the surface of the concrete substrate. Comb the surface of the mortar with the notched side of the trowel. Use the proper size notched trowel for the size of tile to be installed.

3. Before placing tiles into the fresh mortar, wipe the back of each tile with a damp sponge or “Scotch Brite™” pad, to remove any dirt or dusty release agents on the tile backs to enhance the bonding strength.

4. Apply mortar to the back of the cleaned tiles to completely cover the back of the tile with a minimum 3/32" to 1/8" uniform thickness.

5. Place the tiles while the mortar is wet and tacky and beat the tile with a rubber mallet and beating block to firmly bed the tiles into the mortar. Occasionally lift a tile off the mortar bed to check for proper coverage of the mortar. Before hardening, excess mortar shall be cleaned with a damp sponge. Tiles may then be grouted when firmly set.

6. Grouting: Provide stain resistant, colorfast, epoxy grout “Mapei”. Exposed joint widths based on manufacturer's tiles as specified herein shall be typically 1/4" wide for nominal 6" x 6" tiles and 5/16" wide for nominal 12" x 12" tiles. Note:
Joint widths for use with other manufacturer’s products shall be verified with the Architect.

    a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

    b. Preparation: Before starting to grout, remove debris in grout joints and lightly sponge the tile surface to remove all dust and dirt. Water shall not be left standing in joints.

    c. Installation Method:

        1. Empty entire contents of packed liquid premeasured kit product jars into a clean pail/container using a clean mixing stick or margin trowel. Mix thoroughly for one minute. Add at least 3/4 of powder product, using more powder for wider joints, as recommended by the manufacturer.

2. Immediately pour entire content of pail/container onto working area. Use standard epoxy grouting techniques to work grout into grout joints. Insure that all grout joints are fully packed.

3. Clean-up by using a hard epoxy rubber grout float at 90° angle to remove as much excess material as possible before initial cleaning with nylon scrub pad. Do not leave excess grout on the face of tiles.

4. Wash the installation within 12 to 24 hours after grouting using a detergent solution such as “Spic n Span®”, Trisodium Phosphate, “Ajax®”, “Comet®”, or non-abrasive cleaner to remove any haze or residue. Do not allow grout film to remain on surface for more than 24 hours.

D. Metal Edge Trim Strips: Verify in field, height dimension of trim product in relation to thickness of the tile and/or mortar bed, and report to the General Contractor, in writing, any discrepancy detrimental to the proper installation of the product. Install specified metal edge trim angles where shown, and as detailed on the Drawings.

1. Installation: Press the perforated anchoring leg of the trim strip into the tile adhesive and align.
Trowel tile adhesive over the anchoring leg. Surface of the tile shall level with the top of the trim (the trim shall not be higher than the surface of tile, rather slightly lower – approximately 1/32"). The joint between the tile and the trim (approximately 1/32" - 1/8") shall be filled completely with grout.

E. Floor Joint Sealant: Provide control joints in floor Work where Tile Work abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes and where changes occur in backing materials as detailed on the Drawings and/or required by field conditions.

3.05 MARBLE THRESHOLD INSTALLATIONS

A. Install thresholds in white dry set mortar (with latex system) similar to setting of floor tile, and point joints between marble and tile flush.

3.06 COUNTERTOP INSTALLATION

A. Adhesive Applications: Provide Epoxy Adhesive product as specified herein for installation of granite on substrate, as indicated on the Drawings.

1. Preparation:

a. Before using, store resins at room temperature (70°F+21°C+) for 24 hours to ensure ease of mixing. All surfaces must be sound, clean, free of oil, waxes, or other bond inhibiting contaminants.

b. Clean and grind back of granite at areas to receive the Epoxy Adhesive spots using a mechanical wheel grinder with a diamond wheel/blade. Remove dust with a stiff brush, wipe entire surface. Using a damp sponge (not wet), wipe the granite to remove any particles or remaining dust to ensure a clean direct bond and that all ground material is removed. Wipe dry with a clean cloth, then apply Epoxy Adhesive. NOTE: Epoxy Adhesive should not be applied to saturated or wet
granite. If wetness or dampness is observed inside the granite after grinding off the top layer, the granite is saturated and must be allowed to dry out.

2. Mixing: Combine equal volumes of Epoxy Adhesive Part A and Part B (1:1 mix ratio by volume). Mix until uniform in color; no swirls. Small quantities may be mixed with a putty knife or margin trowel. Larger quantities may be mixed with an electric drill mixer (low speed).

3. Application:

a. Apply dabs evenly distributed on back of the granite as recommended by manufacturer. Finished dab thickness must be a minimum of 1/8" (3mm).

b. After installation of Epoxy Adhesive onto the substrate, install onto substrate and adjust for plumb and level.

4. Cleaning: Clean tools and Work while epoxy is fresh, using warm water. Detergent or soap may be added to the water for easier cleaning.

3.07 IMPERFECT TILE WORK

A. When directed by the Architect, and prior to final acceptance of the Work, remove all broken, chipped, loose or otherwise unsatisfactory installed Tile and Countertop Work.

B. Patch and restore imperfect tile materials and workmanship to good condition satisfactory to the Architect and/or Owner.

3.08 PROTECTION

A. Protect installed Work from damage at all times during the progress of the Work.

B. Properly protect all finished Work from damage that is in place at the time this Work is being done. Tile Contractor shall be responsible, and will be required to pay for all damage to other Work caused by the Contractor’s workmen.

C. Protective covering shall be non-staining multi-purpose building paper with compatible seam tape. Product shall be such as “SealTight® Red Rosin Paper” as manufactured by

W.R. Meadows, Inc., 300 Industrial Drive, P.O. Box 338, Hampshire, IL 60140-0338, (800)342-5976, (847)214-2100; www.wrmeadows.com, or comparable equivalent product subject to review by the Architect.

3.09 CLEANING

A. During progress of the Work, keep the premises free of all debris and waste materials resulting from the Work of this section. Remove all debris and rubbish from the site. Upon completion and before final acceptance of the Work, remove all debris, rubbish, unused materials, tools, and equipment from the site.

B. When directed by the Architect, after the Work of other trades is substantially completed, remove and dispose of protective coverings and thoroughly clean all Work installed under this section. Use of acid will not be permitted. Use clean water in initial cleaning. Remove all stains, excessive mortar, etc.

C. Cleaner shall be a neutral, general, all-purpose cleaner free of acids, alkalies and abrasives such as one of the following:

1. Mira Clean #1 by Miracle Sealants Company, 12318 Lower Azusa Road, Arcadia, CA 91006-5872, (800)350-1901 or (626)443-6433.

    a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

2. Super Shine-All® by Hillyard, Inc., 302 North 4th. Street, P.O. Box 909, St. Joseph, MO, 64501, (816)233-1321 or (800)365-1555.

    a. Volatile Organic Compounds (VOC) Content: Paint and coatings product specified herein shall have a VOC content of 65 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

D. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.01 Description of Work

A. Related work specified elsewhere:
1. Section 09260/09 21 16 - Gypsum Board Assemblies

1.02 References

A. ASTM A653/A653m - Standard Specification for Sheet Steel, Zinc-coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process
B. ASTM C423 - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
C. ASTM C635 - Manufacturing of Metal Suspension Systems
D. ASTM C636 - Installation of Metal Suspension Systems in Non-seismic Applications
E. ASTM D2486 - Standard Test Methods for Scrub Resistance
F. ASTM D3273 - Resistance to Growth of Mold of Interior Coatings in an Environmental Chamber
G. ASTM D3273-00 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
H. ASTM D3274 - Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Microbial (Fungal or Algal) Growth or Soil and Dirt Accumulation
I. ASTM D4828 - Standard Test Methods for Practical Washability
J. ASTM D5116-06 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products
K. ASTM E84 - Surface Burning Characteristics of Building Materials
L. ASTM E119 - Fire Tests of Building Construction and Materials
M. ASTM E580 - Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
N. ASTM E1264 - Classification for Acoustical Ceiling Products
O. ASTM E1414 - Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum
P. CISCA Ceiling Systems Installation Handbook.
Q. NFPA 70 - 2008 National Electrical Code (NEC) Section 410-36
R. Fire-response tests are performed by a testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
S. Fire-resistance-rated, acoustical tile ceilings are indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency.
T. CHPS - Collaborative for High-Performance Schools Indoor air quality emission testing of materials.
U. COEHHA - The California Office of Environmental Health Hazard Assessment established exposure limits of chemicals.
V. High Recycled Content (HRC) - Classified as containing greater than fifty percent total recycled content. Total recycled content is based on product composition of post-consumer and pre-consumer (post-industrial) recycled content per FTC guidelines.

1.03 Submittals

A. Coordination drawings: Submit reflected ceiling plans that are coordinated with mechanical, electrical and security work at acoustical ceilings. Show ceiling suspension members, method of anchorage of hangers and ceiling mounted work including light fixtures and air grilles.
B. 6"x6" (min.) samples of each tile type, pattern, and color required.
C. Set of 12-inch- long samples of suspension system members.
D. Set of 12-inch- long samples of exposed moldings for each color and system type required.
E. Submit certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements and warranties.

1.04 Delivery, Storage and Handling of Materials

A. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. B. Storage:
    1. Panels: Storage time of materials at the job site should be as short as possible, and environmental conditions should be as near as possible to those specified for occupancy (see no. 1.05 below). Excess humidity during storage can cause expansion of material and possible warp, sag, or poor fit after installation. Chemical changes in the mat and/or coatings can be aggravated by excess humidity and cause discoloration during storage, even in unopened cartons. Cartons should be removed from pallets and stringers to prevent distortion of material. Long-term (6- 12 months) storage under uncontrolled environmental conditions should be avoided.
    2. Suspension System: Store in manner that will prevent warping, scratches, or damage of any kind.
C. Handling: Handle in such manner to ensure against racking, distortion, or physical damage of any kind.
D. Damaged or deteriorated materials should be removed from the premises.
Immediately before installation, to stabilize tile and panels, store them at a location where temperature and humidity conditions duplicate those ambient during installation and anticipated for occupancy.

1.05 Environmental Conditions

A. Installation of acoustical panels shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from plaster, concrete, or terrazzo work has dissipated.
B. Do not use ceiling panels in extreme or continuous high humidity, or areas exposed directly to weather or water. Ceiling panels are sized and designed for use within the standard occupancy range of temperature and humidity, 65-85 °F (18-29 °C), no more than 70% RH (relative humidity). Humidity can greatly affect product dimensional stability and sag resistance. Sag can become noticeable during periods of high humidity lasting only a few hours. CLIMAPLUS ceilings if used with DONN® Brand Suspension Systems, can withstand temperatures from 60-104 °F (32-40 °C) and relative humidity up to 95%-100% RH. See USG Interiors Inc. for specific warranty information.
C. Allow time for dimensional changes in ceiling panels stored at temperature/humidity conditions well outside of those recommended for service.
With increases in temperature/humidity, these products expand (up to 1/64 in./ft.

(4.3 mm/m) at 85 °F (29 °C)/90% RH) and may not fit into a fixed grid. Conversely, with decreases, these products will be undersize, but expand to normal when standard ambient conditions return.

D. Formaldehyde & VOC Classification, as tested per ASTM D5116 and according to standards established by the Collaborative for High-Performance Schools (CHPS), the California Office of Environmental Health Hazard Assessment (OEHHA), and the USGBC LEED for Schools.
    1. Products are classified as zero- or low-emitting for formaldehyde and VOC emissions as defined:
        a. “Zero-Emitting” - Materials producing concentration levels below the test-chamber background level specified by the "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 addendum. Section 3.8.4.3 states, " Background concentrations in the empty chamber ventilated at 1.0 air changes per hour shall not exceed 2 µg m-3 (1.6 ppb) for any individual VOC, including formaldehyde" and all VOCs with chronic inhalation Reference Exposure Levels adopted by California EPA COEHHA for Proposition 65 chemicals.
        b. ”Low-Emitting” - Materials passing CHPS requirements as established in the "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 addendum. In addition, these products produce formaldehyde concentration levels below 16.5 µg m-3 (13.5 ppb) & contribute no more than one-half of the chronic inhalation Reference Exposure Level adopted by California EPA COEHHA for all other VOCs identified by Proposition 65.
    2. Must be tested by independent lab per these standards along with product submittals.
        a. Documentation of laboratory test must indicate products and item number if test results differ for other facility manufacturing location for supplied products.
    3. Acceptable products must be listed on the Collaborative for High Performance Schools (CHPS) website found at http://www.chps.net/dev/Drupal/node/445.
    4. If only select item numbers within a product family or products formulated in select manufacturing facilities meet the CHPS requirements and are listed on the CHPS website, product literature and samples must clearly indicate that the product meets either zero- or low-emitting standards per the CHPS test protocol. In instances where only select items from a manufacturer meet the CHPS protocol, product packaging or labeling must clearly indicate the product meets the minimum requirements of the CHPS test standard for zero- or low-emitting Products as defined in Section 01350.

1.06 Quality Assurance

A. Single Source Responsibility: To obtain combined warranty for the Donn Brand suspension system and the acoustical panel, color match or ceiling panel and suspension system compatibility, all acoustical panel and suspension system components shall be produced and supplied by one manufacturer. Materials supplied by more than one manufacturer are not acceptable.
B. Subcontractor qualifications: Installer shall have successful experience in the installation of suspended ceiling systems on projects with requirements similar to requirements specified.
C. Requirements of regulatory agencies: Codes and regulations of authorities having jurisdiction.
D. Source quality control:
    1. Test reports: Manufacturer will provide test certification for minimum requirements as tested in accordance with applicable industry standards and/or to meet performance standards specified by various agencies.

2. Changes from system: System performance following any substitution of materials or change in assembly design must be certified by the manufacturer.
3. All ceiling panel cartons must contain UL label for acoustical compliance.
4. All suspension system cartons must contain UL label for load compliance per ASTM C635.

1.07 Project Conditions

A. Existing conditions: (include specific alteration work requirements for project).
1. Environmental requirements for interior installation: Building shall be enclosed with windows and exterior doors in place and glazed, and roof watertight before installation of ceiling system and related ceiling components. 1. Describe ClimaPlus condition C. Coordination with other work:
2. General: Coordinate with other work supported by or penetrating through the ceiling, including mechanical and electrical work and partition systems.
3. Mechanical work: Ductwork above ceiling shall be complete, and permanent heating and cooling systems operating to climate conditions prior to installation of ceiling components.
4. Electrical work: Installation of conduit above ceiling shall be complete before installation of ceiling components.
5. Fire protection work: Fire protection lines and/or equipment occurring above ceiling shall be completed and tested before ceiling components are installed. D. Protection:
   1. Personnel: Follow good safety and industrial hygiene practices during handling and installing of all products and systems, with personnel to take necessary precautions and wear appropriate personal protective equipment as needed. Read material safety data sheets and related literature for important information on products before installation. Contractor to be solely responsible for all personal safety issues during and subsequent to installation; architect, specifier, owner, and manufacturer will rely on contractor's performance in such regard.
   2. Protect completed work above ceiling system from damage during installation of ceiling components.

PART 2 - PRODUCTS

2.01 Materials

A. ACT-1 Spec 1. Acoustical Ceiling Panel
Product: Armstrong Mesa, Square Lay-in
c. Color Finish: White
d. Edge Detail: Reveal sized to fit flange of exposed suspension system members: Square Edge
e. Thickness: 3/4 in
j. Panel Size: 2 ft x 2 ft x 3/4 in
k. Antimicrobial Treatment: Coating based.
l. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30-year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.

A. ACT-1 Spec 1. Acoustical Ceiling Panel

Product: Armstrong Pebble, Square Lay-in

f. Color Finish: White

g. Edge Detail: Reveal sized to fit flange of exposed suspension system members: Square Edge

h. Thickness: 1 in

j. Panel Size: 2 ft x 2 ft x 1 in

m. Antimicrobial Treatment: Coating based.

n. Panel Warranty: When used with an Armstrong suspension system, this panel has a 30-year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years. Panel Warranty: When used with a USG Donn Brand suspension system, this panel has a 30 year warranty that it shall be free from manufacturing defects. When used without a USG Donn Brand suspension system, the period of warranty is 10 years.

2. Metal Suspension System for Acoustical Ceiling Panel

a. General: ASTM C635, commercial quality pretreated and painted hot-dipped galvanized cold-rolled steel, exposed surfaces prefinished in manufacturer's standard corrosion resistant enamel paint finish; color: Flat White #050 or as selected from manufacturer's standard colors. Flat White 050

b. Available Products/ Systems:

1. USG Corporation: USG DONN® Brand DX®/DXL™ 15/16" Acoustical Suspension System

c. Suspension System Components:

1. Fire Rated Main Tees: UL Classified Intermediate Duty Classification; double-web design; 1.64 in. high; rectangular top bulb; 15/16 in. exposed flange with roll-formed steel cap; cross tee holes and hanger wire holes at 6 in. o.c.; convenience holes at approximately 2 in. o.c.; integral reversible splices.
2. Cross tee: 1-1/2 in. high; roll-formed into double-web design with rectangular bulb; 15/16 in. exposed flange with prepainted steel cap; high tensile steel end clips clenched to web. 1 in. high; roll-formed into double-web design with rectangular bulb; 15/16 in. exposed flange with prepainted steel cap; high tensile steel end clips clenched to web. Main tees and cross tees shall be positively locked, yet shall be removable without the use of tools.

d. Accessories:

1. Wall Molding: Angle shape; 7/8 in. mounting flange by 7/8 in. face flange or 1 in. mounting flange by 2 in. face flange or 2 in. mounting flange or 2 in. face flange; hemmed edges; exposed surface pre-finished to match suspension system components.
   I. Inside Corner: Field-mitered joints at wall molding; Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding.
   II. Outside Corner: Prefabricated corner cap; formed to 90° angle; hemmed edge; size and finish to match wall molding.
2. Channel Molding: U-shape; hemmed edges; exposed surfaces pre-finished to match suspension system components; 1" or 1/2" exposed flange by depth as required for ceiling material

e. Suspension System Attachment devices

1. Hanger Wire: Galvanized carbon steel; soft temper; prestretched; yield stress load at least three times the design load but not less than 12-gauge.

f. Suspension System Warranty: When used with a USG acoustical ceiling panel, this suspension system has a Lifetime 30 year warranty that it shall be free from the occurrence of 50% red rust. When used without a USG acoustical ceiling panel, the period of warranty is 10 years.

2.02 Fabrication

A. Trim: Edges extruded to mate with attachment clips and provide positive mechanical lock with no visible fasteners. Factory finished to match approved samples.
B. Splice Plates: Formed to screw into and provide positive lock between abutting pans with no visible fasteners. Factory finished to match trim.
C. Mounting Clips: Formed to screw-attach to trim and provide positive mechanical lock with no visible fasteners while providing a variable angle, screw-fastened connection to suspension members which intersect the trim.

PART 3 - EXECUTION

3.01 General

A. Standard for Ceiling Suspension System Installations: Comply with ASTM C636.
B. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
C. CISCA Ceilings Systems Handbook.
D. NFPA 70 – 2008 National Electrical Code (NEC) Section 410-36.
E. All applicable local and state codes.

3.02 Inspection

A. Examine areas to receive ceiling panels for conditions that will adversely affect installation. Provide written report of discrepancies.
B. Do not start work until unsatisfactory conditions are corrected.
C. Work to be concealed: Verify work above ceiling is complete and installed in manner that will not affect layout and installation of ceiling panels.
D. Beginning of installation shall signify acceptance of conditions in areas to receive ceiling panels.
E. Fire-rating requirements: Construction above fire-rated assembly shall meet requirements of UL Design specified in *2: Products.*

3.03 Preparation

A. Field dimensions: Installer must verify actual field dimensions prior to installation.
B. Renovation work: Installing contractor shall verify that existing ceiling structure is adequate to support additional Compasso ceiling suspension requirement.
C. Coordination: Coordinate and schedule installation of ceiling system with work of other trades affected by this installation, with particular attention given to mechanical and electrical work required to be installed and operating before ceiling work can begin.

3.05 Field Quality Control

A. Deflection on installed system: Maximum deflection shall not exceed 1/360 of the span.

3.06 Cleaning

A. Suspension System: Remove panel material and perform any necessary cleaning maintenance with non-solvent based commercial cleaner
B. Immediately remove any corrosive substances or chemicals that would attack painted finishes (i.e. wallpaper adhesives)
C. Touch up all minor scratches and spots, as acceptable, or replace damaged sections when touch-up is not permitted
D. Painting: Repainting of suspension member shall be with a high-quality solvent base enamel paint and applied as recommended by paint manufacturer. Ceiling panels may be touched-up by spraying a thinned, non-bridging vinyl-acrylic flat wall paint. The type of paint selected and the method of application can alter the acoustical performance and fire ratings of any acoustical product. Therefore, USG Interiors, Inc. cannot guarantee that the field-painted panels will match the published performance.
E. Removal of debris: Remove all debris resulting from work of this section.

END OF SECTION

SECTION 09 65 13
RESILIENT BASES AND ACCESSORIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, and services necessary for Resilient Bases and Accessory Work indicated on the Drawings and specified herein. Work includes, but is not limited to the following:

1. Roppe Vinyl Transition Strips- (Colors to be selected by Architect refer to plans for color and location.)

2. Roppe Pinnacle butt-toe Rubber Wall Base- ASTM F-1861, Type TS, 4” and 6”in height (120’ coil) Straight and cove. (Refer to plans for location)

B. Color Selections: Refer to the Drawings.

C. Room Finish Schedule: Refer to the Drawings.

D. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Cast-in-Place Concrete - Section 03 30 00.

2. Rough Carpentry - Section 06 10 00.

3. Tile Work - Section 09 31 00.

1.02 QUALITY ASSURANCE

A. General: All material incorporated in the Work shall be subject to the Architect’s and Owner’s review. Methods of preparation, construction, and installation shall be in accordance with manufacturer’s printed specifications, unless otherwise directed by the Owner’s Representative.

B. Unacceptable Materials: Material containing asbestos fibers are prohibited.

1.03 SUBMITTALS

A. General: Submit Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

C. Samples: Submit Samples of all materials for approval PRIOR to installation. Installed materials shall match approved Samples.

1. Submit the following Samples of each type, color and pattern required:

a. Accessories: 12" long Samples of items such as reducer strips, transition strips, and wall bases.

1.04 DELIVERY AND STORAGE

A. Delivery: Deliver only approved materials to the site in original boxes, crates, wrappings, clearly labeled with pertinent information to facilitate checking.

B. Storage: Store the materials at the site off the ground and in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Material Shelf Life: Do not retain material at the jobsite which has exceeded the shelf life recommended by the manufacturer.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.05 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expenses any imperfections which may develop during the period specified, and damage to other Work caused by imperfections or repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

1.06 EXTRA MATERIAL

A. General: At completion of the Work, deliver to Owner's Representative, additional replacement materials, in unopened boxes, sealed, and clearly labeled for maintenance purposes, in the following amounts:

1. Rubber Wall Bases: Thirty-two (32) lineal feet of each base type, size and color installed. Bases shall be of equal lengths not less than 4'-0".

PART 2 - PRODUCTS

2.01 A. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MATERIALS

A. Transition Strips: Roppe Brand

1. Colors: As indicated on drawings.

B. Rubber Wall Bases Types:

1. Roppe Vinyl Transition Strips- (Colors to be selected by Architect refer to plans for color and location.)

2. Roppe Pinnacle butt-toe Rubber Wall Base- ASTM F-1861, Type TS, 4" and 6" in height (120' coil) Straight and cove. (Colors to be selected by Architect refer to Room Finish Schedule sheet A6.11 for color and location.)

3. Provide pre-molded outside corner base units where required by Drawings or Project conditions.

C. Patching Compound: Fast patch compound brand name product of type recommended by the manufacturer of the resilient flooring material.

D. Adhesives: Cutback or clear thin spread type products recommended by the manufacturer of resilient flooring materials. Waterproof adhesives shall be used without adulteration. Floor tile adhesive shall not be used for wall bases, and wall base adhesive shall not be used for Floor Tile Work.

1. Volatile Organic Compounds (VOC) Content: Adhesives product specified herein shall have a VOC content of 50 grams/liter or less when calculated according to 40 CFR 59, subpart D (EPA method 24).

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSPECTION AND PREPARATION

A. Inspection: Carefully inspect all surfaces upon which resilient flooring materials are to be applied. Notify the General Contractor for correction of any defects. Starting Work shall imply acceptance of the job conditions, and an unsatisfactory surface condition for the installation of the materials will not be considered valid in waiving any portion of the warranty.

1. Concrete floors to receive resilient flooring materials shall be smooth and of uniform steel trowel finish, free of curing or sealing compounds.

B. Preparation: Resilient bases and accessories shall not be laid on uncured or damp concrete. All concrete surfaces receiving resilient flooring materials shall be tested for dampness prior to installation of the flooring material. The following test may be used, or alternate methods as recommended by the resilient flooring manufacturer may be substituted.

1. Test Method for Dampness: Brush on floor primer in several areas approximately 3' x 3', preferably in area least subject to drying conditions. If after twenty-four (24) hours the primer can be scraped or peeled from the surface, the surface is unsuitable for installation of the resilient flooring material. Allow surface to dry further; retest until primer is well bonded to the surface, whereupon installation may proceed.

2. Concrete Floor Preparation: Concrete subflooring to receive resilient flooring materials shall be prepared in accordance with the manufacturer’s printed instructions and recommendations.

3.02 INSTALLATION

A. General: Install all resilient flooring materials specified herein and as indicated on the Drawings in accordance with the manufacturer’s printed specifications.

B. Vinyl Transition Strips: Provide transition strips as required by Drawings and/or field conditions.

C. Wall Bases: Install premoulded wall bases including external and internal corners, coped neat and sharp.

1. Carpeted Areas: Coordinate Work with Carpeting Contractor for wall bases required in carpeted areas.

2. Prefabricated Cabinet Toe Boards: Install wall bases for exposed toe bases of prefabricated base cabinets.

D. Bonding Assurance: After installation, floors shall be rolled with heavy roller as recommended by the manufacturer to insure proper bond. Roller surface shall be such as not to damage or otherwise mar finish surfaces of resilient flooring.

3.03 CLEANING PROTECTION

A. General: Soon after installation of resilient bases and accessories, wipe-off all surplus adhesive and leave surfaces clean and free of surface marks or blemishes. All Work shall be thoroughly cleaned at time of completion, at the final completion of the building areas, and prior to occupancy when directed by the Architect.

B. Washing: Resilient flooring materials shall not be washed until time period recommended by resilient flooring materials manufacturer has elapsed, to allow materials to become well-sealed in adhesive.

C. Cleaning, Rinsing, and Sweeping: Clean and rinse all resilient bases and accessories with 140°F. water, and dry. Sweep clean with untreated yarn broom.

D. Protection: Protect all traffic areas of resilient flooring with undyed, untreated building paper.

3.04 DAMAGED WORK

A. All damaged or Defective Work shall be replaced. All other Work which becomes damaged in replacing Defective Work shall be replaced by Resilient Flooring Materials Contractor. Patched Work will not be accepted.

3.05 CLEAN-UP

A. During progress of the Work the premises shall be kept free of all debris and waste materials resulting from the Work of this section. All debris and rubbish shall be removed from the site. Upon completion of Work and before final acceptance of the Work, all debris, rubbish, unused materials, tools, and equipment shall be removed from the site.

B. Waste Management: Collect field generated construction waste created during construction or final.

END OF SECTION

SECTION 09 65 19.19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
    1. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.
B. Related Documents
    1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.
C. Related Sections:
    1. Other Division 9 sections for floor finishes related to this section but not the work of this section

1.02 REFERENCES

A. Armstrong Flooring Technical Manuals
    1. Armstrong Flooring Guaranteed Installation Systems manual, F-5061
    2. Armstrong Flooring Maintenance Recommendations and Procedures, manual, F-8663
B. ASTM International:
    1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
    2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
    3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
    4. ASTM F 1066 Standard Specification for Vinyl Composition Tile
    5. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
    6. ASTM F 1861 Standard Specification for Resilient Wall Base
    7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
    8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
C. National Fire Protection Association (NFPA):
    1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
    2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
B. Administrative Requirements
    1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer’s installation instructions and

manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

2. Pre-installation Testing: Conduct pre-installation testing as follows: [Specify testing (i.e. moisture tests, bond test, pH test, etc)

C. Test Installations/ Mock-ups: Install at the project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.
   1. Mock-Up Size: As recommended by Architect.
   2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
   3. Incorporation: Mock-up may be incorporated into the final construction with Owner's approval.

D. Sequencing and Scheduling
   1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.
   2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test. using an Armstrong high moisture adhesive.

1.04 SUBMITTALS

A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061) for flooring and accessories.

B. Submit the manufacturer's standard samples showing the required colors for flooring and applicable accessories.

C. Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.

D. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.

E. Closeout Submittals: Submit the following:

   1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

   2. Warranty: Warranty documents specified herein

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.

B. Select an installer who is experienced and competent in the installation of Armstrong resilient vinyl composition tile flooring and the use of Armstrong Flooring subfloor preparation products.

1. Engage installers certified as Armstrong Commercial Flooring Certified Installers
2. Confirm installer's certification by requesting their credentials

C. Fire Performance Characteristics: Provide resilient vinyl composition tile flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:

1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less
3. CAN/ULC-S102.2 – Flame Spread Rating and Smoke Developed – Results as tested.

1.06 DELIVERY, STORAGE AND HANDLING

A. Comply with Division 1 Product Requirements Sections

B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.

D. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.07 PROJECT CONDITIONS

A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65ºF (18ºC) and a maximum temperature of 100ºF (38ºC) for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55ºF (13ºC) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to the Armstrong Flooring Guaranteed Installations Systems manual, F-5061 for a complete guide on project conditions.

1.08 LIMITED WARRANTY

A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.

B. Limited Warranty Period: 5 years

C. Limited Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

1.09 EXTENDED SYSTEM LIMITED WARRANTY

A. Resilient Flooring System: Submit a written warranty executed by the manufacturer, agreeing to repair or replace system (subfloor preparation products, adhesive, and floor covering) that fails within the warranty period.

B. Limited Warranty Period: 10 years on top of the Resilient Flooring Limited Warranty

C. [S-453 Level Strong™ cement based self-leveling compound] [S-456 Patch Strong™ flexible patching and smoothing compound] [S-454 Prime Strong™ acrylic primer for porous substrates] [S-455 Prime Strong™ acrylic primer for non-porous substrates] [S-452 Seal Strong™ two part moisture mitigation system]

D. The installation of an Armstrong Flooring product along with the recommended Armstrong Flooring adhesive, as well as any one of the Strong System subfloor preparation products listed above, provides 10 additional years of limited warranty coverage. The Strong System limited warranty covers the installation integrity for the length of the flooring product warranty plus 10 years. In order to qualify for the Strong System Warranty, any subfloor preparation product needed for an installation must be an Armstrong Flooring product.

E. For the System Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

F. When Armstrong Flooring Strong System subfloor preparation products are used with other manufacturers' floor coverings, adhesives, or other subfloor preparation products, Armstrong Flooring warrants our products to be free from manufacturing defects from the date of purchase through the limited warranty period of 15 years.

1.10 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.

1. Quantity: Furnish quantity of flooring units equal to [5] % of amount installed.
2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Resilient tile flooring, wall base, adhesives and subfloor preparation products and accessories:

Armstrong Flooring Inc., 2500 Columbia Avenue, Lancaster, PA 17604,
www.armstrongflooring.com/commercial

1. Manufacturer must have a headquarters in the United States of America

2.02 RESILIENT TILE FLOORING MATERIALS

A. Provide Vinyl Composition Tile: Standard Excelon® Imperial® Texture Tile Flooring manufactured by Armstrong Flooring, Inc.

1. Description: Tile composed of polyvinyl chloride resin, plasticizers, fillers, stabilizers and pigments with colors and texture dispersed uniformly throughout its entire thickness.
2. Vinyl composition tile shall conform to the requirements of ASTM F 1066, “Standard Specification Vinyl Composition Floor Tile", Class 2, through-pattern
3. Pattern and Color: Selected from the range currently available from Armstrong Flooring, Inc. Refer Architects Room Finish Schedule sheet number A6.11 and floor pattern plan.
4. Size: 12 in. x 12 in. (305 mm x 305 mm)
5. Thickness: [1/8"/0.125 in. (3.2mm)] [3/32"/0.095 in. (2.4mm)]

2.03 PRODUCT SUBSTITUTION

A. Substitutions: No substitutions permitted because of the specific attributes listed in Section 2.02.

2.05 ADHESIVES

A. For Tile Installation System, Full Spread: Provide Armstrong [S-515 Floor Tile Adhesive] [S-525 BBT® Bio-Flooring Adhesive] [S-700 Floor Tile Adhesive Thin Spread] [S-750 Premium Floor Tile Adhesive] under the tile and Armstrong S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer.

B. For Tile Installation System, Tile On: Provide Armstrong [S-515 Floor Tile Adhesive] [S-525 BBT® Bio-Flooring Adhesive] [S-750 Floor Tile Adhesive Thin Spread] under the tile over smooth, completely bonded existing resilient flooring and Armstrong S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer.

C. For Tile High-Moisture Installation Warranty, Full Spread: Provide Armstrong [S-515 Floor Tile Adhesive] [S-525 BBT® Bio-Flooring Adhesive] under the tile and Armstrong S-725 Wall Base Adhesive at the wall base as recommended by the flooring manufacturer.

2.06 ACCESSORIES

A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Armstrong [S-184 Fast-Setting Cement-Based Patch and Underlayment] [S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive] [S-453 Level Strong™ cement based self-leveling compound] [S-456 Patch Strong™ flexible patching and smoothing compound].

B. [For priming porous substrates to aid in adhesive bond strength and reducing subfloor porosity, provide S-454 Prime Strong™ acrylic primer for porous substrates. For non-porous substrates, provide S-455 Prime Strong™ acrylic primer for non-porous substrates].

C. [For creating a moisture barrier, provide S-452 Seal Strong™ two part moisture mitigation system].

D. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.

E. Provide transition/reducing strips tapered to meet abutting materials.

F. Provide threshold of thickness and width as shown on the drawings.

G. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.

H. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).

B. Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.

C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.

E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.03 PREPARATION

A. [Subfloor Preparation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, and other defects with Armstrong Flooring [S-184 Fast-Setting Cement-Based Patch and Underlayment][S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive] [S-453 Level Strong™ cement based self-leveling compound] [S-456 Patch Strong™ flexible

patching and smoothing compound] [S-454 Prime Strong™ acrylic primer for porous substrates] [S-455 Prime Strong™ acrylic primer for non-porous substrates] as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.]

B. [Subfloor Preparation Moisture Mitigation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, mitigate moisture and other defects with Armstrong Flooring S-453 Level Strong™ cement based self-leveling compound as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.]

C. Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate they must be mechanically removed prior to the installation of the flooring material.. Refer to the Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.

D. For Tile Installation System, Full Spread when using S-700 or S-750 adhesive, perform subfloor moisture testing in accordance with [ASTM F 2170, “Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in-situ* Probes”][ASTM F 1869,Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride] and Bond Tests as described in the Armstrong Flooring Guaranteed Installation Systems manual, F-5061, to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Relative humidity shall not exceed 80%. MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs. On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained

E. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

3.04 INSTALLATION OF FLOORING

A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. Failure to comply may result in voiding the manufacturer’s warranty listed in Section 1.08.

B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.

C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.

D. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.

E. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.05 INSTALLATION OF ACCESSORIES

A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.

B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.

C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.

D. Apply [butt-type] [overlap] metal edge strips where shown on the drawings, [before] [after] flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

3.06 CLEANING

A. Perform initial and on-going maintenance according to the latest edition of the maintenance recommendations for Standard Excelon Imperial Texture.

3.07 PROTECTION

A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings. (See Finishing The Job in the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061.)

END OF SECTION

SECTION 09 81 00
ACOUSTIC INSULATION

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Formaldehyde-free™ fiberglass Sound control insulation.
Related Sections: The following items of related Work will be provided under other sections of the Specifications:

1. Division 7 Section: Roof Deck Insulation.

2. Division 7 Section: Joint Sealants.

3. Division 9 Section: Gypsum Board.

4. Division 9 Section: Acoustical Ceilings.

5. Division 15 Section: Mechanical: Duct insulation, Equipment insulation And Pipe insulation.

1.02 REFERENCES

A. ASTM International:

1. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulations.

2. ASTM C356 Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat.

3. ASTM C411 Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

4. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

5. ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

6. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

7. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

8. ASTM C764 Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation.

9. ASTM C1014 Standard Specification for Spray-Applied Mineral Fiber Thermal and Sound Absorbing Insulation.

10. ASTM C1015 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.

11. ASTM C1104 Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

12. ASTM C1149 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation

13. ASTM C1304 Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials.

14. ASTM C1320 Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

15. ASTM C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.

16. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

17. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

18. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.

19. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.

20. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

21. ASTM E736 Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
22. ASTM E759 Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members.

23. ASTM E970 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide batt Insulation that have been manufactured, fabricated and installed to the following criteria:

1. Surface Burning Characteristics, Unfaced (ASTM E84): Flamespread index 25, smoke developed 50.

2. Combustibility (ASTM E136): Noncombustible.

3. Formaldehyde Content: Free of formaldehyde.

4. Assembly Fire Resistance Rating (ASTM E119): As shown in dwgs.

5. Assembly Sound Transmission Rating (ASTM E90): Refer product specifications.

6. Sound Absorption (ASTM C423): Refer product specifications.

7. Thermal Performance (ASTM C518): R11

1.04 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

C General: Submit listed submittals in accordance with provisions of Section 01300 Administrative Requirements.

D. Product Data: Submit manufacturer’s product data and installation instructions, including manufacturer’s SPEC-DATA® sheets.

E. Samples: Submit manufacturer’s standard selection and verification samples.

F. Quality Assurance/Control Submittals: Submit the following:

1. Test Reports: Upon request, submit Fire, Sound And Therma] test reports from recognized test laboratories.

2. Certificates: Submit manufacturer's certificate that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Obtain each type of building insulation through a single source.

B. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size and complexity.

C. Pre-installation Meetings: Refer Division One Specifications.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirement Section.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

PART 2 PRODUCTS

2.01 SUBSTITUTIONS:

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 FORMALDEHYDE-FREE™™ BUILDING INSULATION

A. Manufacturer: Johns Manville.

1. Contact: 717 17th Street 80202; PO Box 5108, Denver, CO 80217-5108; Telephone: (800) 654-3103; Fax: (303) 978-2318; E-mail: pic@jm.com; website: www.specJM.com.

B. Proprietary Products/Systems: Building insulation, including the following:

1. JM Formaldehyde-free™ ComfortTherm® Poly-Encapsulated Batts:

    a. Thermal Resistance (R-Value) (ASTM C518): R-11

    b. Combustion Characteristics (ASTM E136): Pass.

    c. Critical Radiant Flux (ASTM E970): Greater than 0.11 Btu/ft^2 × s (0.12 W/cm^2).

    d. Water Vapor Permeance (ASTM E96): 0.5 perm (30 ng/Pa × s × m^2).

    e. Water Vapor Sorption (ASTM C1104): 5% or less by weight.

    f. Odor Emission (ASTM C1304): Pass.

    g. Corrosiveness (ASTM C665, 13.8): Pass.

    h. Fungi Resistance (ASTM C1338): Pass.

    i. Recycled Content: Certified by Scientific Certification Systems to contain minimum of 20% post-consumer and 5% pre-consumer recycled glass product, on average of manufacturer's products.

    j. Prove through documentation that product passes CIWMB Section 01350 for indoor air quality.

    k. Thickness: 3 ½ "

    l. Flamespread (ASTM E84): 25, maximum.

    m. Smoke Developed (ASTM E84): 50, maximum.

    n. Material Standard: ASTM C665, Type II, Class A (membrane-faced surface with a flamespread of 25 or less), Category 1 (membrane is a vapor barrier).

2.03 ACCESSORIES

A. Tape: Self-adhesive vapor retarder tape with flame spread index of 25 or less, smoke developed index of 50 or less.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Comply with the instructions and recommendations of the building insulation manufacturer.

3.02 EXAMINATION

A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for installation of building insulation.

2. Do not proceed with installation of building insulation until unacceptable conditions are corrected.

B. Refer to Section 01 31 00 – Project Management & Coordination

C. Refer to Section 01 73 00 – Execution

3.03 PREPARATION

A. Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.04 INSTALLATION

A. General: Comply with insulation manufacturer's written instructions applicable to products and application indicated.

1. Install insulation that is undamaged, dry and unsoiled and that has not been left exposed at any time to ice and snow.

2. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation.

3. Water Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

4. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

B. Installation of General Building Insulation:

1. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic or sealant as recommended by insulation manufacturer.

2. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
   a. Tape ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

3. Install glass-fiber blankets in cavities formed by framing members according to the following requirements:

   a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.

   b. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

   c. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.

4. Wood-Framed Construction: Install mineral-fiber blankets in accordance with ASTM C1320 and as follows:

   a. With faced blankets having stapling flanges, secure insulation by friction fit inset or face stapling flanges to sides of framing members.

   b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

5. Acoustical Insulation Installation: Install insulation where indicated in sound rated assemblies. Maintain acoustical rating of assembly.

6. Board Insulation Installation: Install insulation where indicated:

   a. Cut and friction fit insulation between vertical or Z-shaped framing.

b. Alternatively install insulation on impaling pins or with suitable adhesives.

c. Place pins 3 inches - 5 inches (76 - 127 mm) from edges of insulation.

7. Loose-Fill Insulation: Place loose-fill insulation into spaces and onto surfaces as shown, by machine blowing to comply with ASTM C1015. Level horizontal applications to uniform thickness as indicated. Hold insulation back from air vents, flues and heat-generating appliances.

E. Installation of Vapor Retarders:

1. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

2. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

3. 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 retarder.

4. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor retarder tape or another layer of vapor retarder.

3.05 PROTECTION

A. Protect installed work from damage due to subsequent construction activity on the site. Repair damage to installed products prior to installation of finish materials.

3.06 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 09 90 01
PAINTS AND COATINGS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this section are in addition to shop priming and surface treatment specified under other sections.

B. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available. Sherwin Williams Coatings listed at the end of this specification where used to establish the level of quality of the coating systems. The coating manufacturer shall match the colors identified in the finish schedule.

1. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts, and labels.

1. Pre-finished items not to be painted include the following factory-finished components:

a. Acoustic materials.

b. Finished mechanical and electrical equipment.

c. Light fixtures.

d. Switchgear.

e. Distribution cabinets.

f. Plastic laminate wood doors.

g. Wood veneer doors

h. Metal lockers.

i. Plastic laminate covered architectural casework.

j. Wood veneer woodwork and casework.

k. Metal flashings.

l. Curtain wall system.

2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:

a. Furred areas.

b. Pipe spaces.

c. Ceiling plenums, with the following exception:

3. Finished metal surfaces not to be painted include:

a. Anodized aluminum.

b. Stainless steel.

c. Chromium plate.

d. Copper.

e. Bronze or brass.

4. Operating parts not to be painted include moving parts of operating equipment such as the following:

a. Valve and damper operators.

b. Linkages.

c. Sensing devices.

d. Motor and fan shafts.

5. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.02 RELATED SECTIONS: The following items of related Work will be provided under other sections of the Specifications:

A. Section 01 35 45 - Sustainable Design Project Requirements.

B. Section 01 74 19 - Construction Waste Management

C. Section 05 12 00 - Structural Steel Framing: Shop Primed Items.

D. Section 05 21 00 - Steel Joist Framing: Shop Primed Items.

E. Section 05 50 00 - Metal Fabrications: Shop Primed Items.

F Section 05 51 00 - Metal Stairs: Shop Primed, Field Painted.

G. Section 08 12 14 - Standard Steel Frames: Shop Primed, Field Painted.

H. Section 08 13 14 - Standard Steel Doors: Shop Primed, Field Painted.

I. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

J. Section 23 05 53 - Identification for HVAC Piping and Equipment.

K. Section 26 05 53 - Identification for Electrical Systems.

L. Section 27 05 53 - Identification for Communication Systems.

M. Section 05 05 13 - Shop Applied Coatings for Metal

N. Section 06 01 40 - Architectural Woodwork Refinishing

O. Section 06 05 83 - Shop Applied Wood Coatings

P. Section 07 19 00 - Water Repellents.

Q. Section 09 67 00 - Fluid Applied Flooring for Concrete

R. Section 09 93 00 - Stains and Transparent Finishes

S. Section 09 96 00 - High-Performance Coatings

1.03 REFERENCES

A. SSPC-SP 1 - Solvent Cleaning

B. SSPC-SP 2 - Hand Tool Cleaning

C. SSPC-SP 3 - Power Tool Cleaning

D. SSPC-SP 13 / Nace No. 6 Surface Preparation for Concrete

E. EPA-Method 24

F. GS-11, GC-03

1.04 SUBMITTALS

A. General: Submit Shop Drawings and Product Data to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Submit, in accordance with, Section 01 33 00 – Submittal Procedures.

C. Product Data: Manufacturer's technical information, label analysis, application instructions and MSDS sheets for each material proposed for use.

1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

2. Provide Material Safety and Data Sheets on each product specified.

D. Samples: Upon selection of colors by the architect, submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

1. On 12" x 12" hardboard, provide one sample of each paint color listed in the color schedule, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved. Samples shall be steeped to show primer, first coat, and second coat.

2. On actual wood surfaces, provide two 4" x 8" samples of stained wood finish.

3. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples when requested by Architect. On at least 100 sq. ft. of surface as directed, provide full-coat finish samples until

required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

4. Do not proceed with painting until materials and finishes are approved by Architect.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of problems anticipated using the materials specified.

C. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products named are required or to exclude equal products of other manufacturers.

2. Federal Specifications establish a minimum quality level for paint materials, except where other product identification is used. Provide written certification from the manufacturer that materials provided meet or exceed these criteria.

3. Products that comply with qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to the Architect. Furnish material data and manufacturer's certificate of performance to Architect for proposed substitutions.

D. Interior coating type: Provide interior painting systems which are VOC compliant as per Green Seal Environmental Standard GS-11 for interior paint VOC thresholds:

1. Non-flat: VOC not more than 50 g/L.

2. Flat: VOC not more than 50 g/L.

E. Interior/Exterior coatings type: Provide interior/exterior coating systems which are VOC compliant as per Rule 1168 of the South Coast Air Quality Management District for coatings, primers, stains:

1. Primers, Sealers and Undercoaters: VOC not more than 200 g/L.

2. Clear Wood Finishes:

   a. Varnish: VOC not more than 350 g/L.

   b. Sanding Sealers: VOC not more than 350 g/L.

   c. Lacquers: VOC not more than 275 g/L.

3. Stains, interior: VOC not more than 250 g/L.

4. Floor coatings: VOC not more than 100 g/L.

F. Exterior coating type: Provide exterior painting systems which are VOC compliant as per Green Seal Environmental Standard GS-11 for exterior paint VOC thresholds:

1. Non-flat: VOC not more than 200 g/L.

2. Flat: VOC not more than 100 g/L.

G. Interior/Exterior anti-corrosive and anti-rust coating types for ferrous metals: Provide interior/exterior painting systems for ferrous metals which are VOC compliant as per Green Seal Environmental Standard GC-03 for interior/exterior paint VOC thresholds:

1. Gloss: VOC not more than 250 g/L.

2. Semi-Gloss: VOC not more than 250 g/L.

3. Flat: VOC not more than 250 g/L.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the 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. Federal Specification number, if applicable.

4. Manufacturer's stock number and date of manufacture.

5. Contents by volume, for pigment and vehicle constituents.

6. Thinning instructions.

7. Application instructions.

8. Color name and number.

9. 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 (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. 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.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.07 JOB CONDITIONS

A. Section 01 60 00 – Product Requirements.

B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint manufacturer.

C. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

D. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

E. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

F. Provide lighting level of 80 foot candle measured mid-height at substrate surface.

1.08 EXTRA MATERIAL

A. Provide one gallon of each different paint system, and color with manufacturers name and color clearly labeled on the top of each container.

1.09 PRE-PAINTING CONFERENCE

A. Prior to finish painting, exterior and interior, General Contractor shall schedule a "Pre-Painting Conference" to be attended by the Architect, Contractor, Painting Subcontractor and Manufacturer's Representative (Manufacturer's Rep. to attend when required for special finishes.)

B. Agenda to include submittal of color and finishes sample (RE: Article 1.04 "Submittals" and review of color schedule.

C. Contractor to record discussions of conference including agreements and/or disagreements and distribute a copy of record to each party in attendance.

PART 2 - PRODUCTS

2.01 SUBSTITUTION

A. Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 MANUFACTURERS

A. Coating Manufacturer:

1. Sherwin-Williams (S-W).

a. Refer to "List of Finishes" located on the drawings for paint colors. Coating manufacturer shall computer match the colors selected.

B. Substitutions are permitted. Coating systems submitted from Benjamin Moore and Co. or Pratt and Lambert shall match the systems including VOC limits and ASTM numbers specified at the end of this section.

C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

1. Lead content in pigment, if any, is limited to contain not more than 0.06% lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Refer to Section 01 31 00 – Project Management & Coordination

C. Refer to Section 01 73 00 - Execution

3.02 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing of problems anticipated with using the specified finish-coat material with substrates primed by others.

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 dust off.

a. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knob sealer before application of 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 upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

c. When transparent finish is required, backprime with spar varnish.

d. Seal tops, bottoms, and cutouts of wood doors with a heavy coat of varnish or sealer immediately upon delivery.

3. Ferrous Metals: Clean non-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 recommendations of the Steel Structures Painting Council.

a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

4. Galvanized Surfaces: Allow to weather a minimum of 6 months prior to coating. Clean per SSPC-SP1 using detergent and water or a degreasing cleaner, then prime as required. When weathering is not possible or the surface has been treated with chromates or silicates, first Solvent Clean per SSPC-SP1 and apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 as necessary to remove these treatments.

5. Aluminum: Remove all oil, grease, dirt, oxide and other foreign material by solvent cleaning per SSPC-SP1, solvent cleaning.

6. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer’s written instructions.

c. Cementitious materials shall have cured for a minimum of 30 days prior to painting.

d. Damaged areas shall be repaired using appropriate materials.

7. Drywall: Surface must be clean and dry. All nail or screw heads must be set and spackled. Joints must be taped and covered with joint compound. Spackled fastener heads and tape joints must be sanded smooth and all dust removed prior to painting.

8. Previously coated surfaces: Remove all surface contamination such as oil, grease, loose paint, mill scale, dirt, rust, mold, mildew, mortar efflorescence and scalers. Glossy surfaces of old paint films shall be clean and dull before painting. Clean and dull surface either by washing with an abrasive cleaner, or by washing

and sanding. Spot prime bare areas with appropriate primer. Check for compatibility by applying a test patch of the specified system, coating an area of 3 square feet. Allow to dry for one week before testing adhesion as per ASTM D3359. If coating is incompatible, prepare surface in conformance with ASTM D4259.

C. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of 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. Remove film and if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

3.03 APPLICATION

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Non-zinc coated architectural metals, steel doors and steel frames shall have all coatings spray applied. Brush application is not acceptable.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in "schedules."

2. Provide finish coats that are compatible with primers used.

3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

5. 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.

6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.

8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

9. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.

10. Sand lightly between each succeeding enamel or varnish coat.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical work: Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces.

F. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and 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 assure a finish coat with no burn through or other defects due to insufficient sealing.

G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth 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. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

I. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

J. 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.

K. Stripple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.04 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.05 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.06 EXTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates, as indicated:

B. Metals:

1. Ferrous Metal (Anti-Corrosive coating):

a. Sherwin Williams Acrolon 218 HS Polyurethane: 1 finish coat over primer on properly prepared surface:

b. Primer:

1) Sherwin-Williams Macropoxy 646 – One coat over prepared-cleaned surfaces

3. Stucco Surfaces and EIFS Substrates:

a. Primer:

1) Sherwin-Williams Loxon Concrete and Masonry Primer A24W8300 VOC: 97 g/L.

b. First and Second Coats:

1) Sherwin-Williams ConFlex XL High Build Elastomeric A05-450 Series (13.0 - 16.0 mils wet, 6.0 - 7.5 mils dry per coat)

4. Bollards

a. Primer:

1) Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer B66W300 VOC: 97 g/L.

b. First and Second Coats:

1) Sherwin-Williams Pro Industrial Urethane Alkyd (Safety Yellow) B54-150 Series

5. Parking Striping/Curb Ramps

a. One Coat:

1) Sherwin-Williams Set Fast Acrylic Traffic Marking Paint (Yellow)

3.07 INTERIOR PAINT SCHEDULE

A. General: Provide the following paint systems for the various substrates as indicated.

B. Drywall (walls and ceiling): Furnish sample on 2'x2' piece of drywall for architect to approve prior to application.

1. Gypsum Drywall Systems:

a. Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

b. Texture

1) USG Sheetrock Brand Wall and Ceiling Spray Texture (Multipurpose) (fine orange peel).

2) Texture Additive: Sheetrock Brand First Coat: Add at a rate of 1 gal. per bag of texture-substitute for 1 gal. of water.
VOC: 2 g/L.

c. Primer:

1) Sherwin-Williams Pro Mar 200 Zero VOC Primer B28W2600 (4 mils wet; 1.3 mils dry)
VOC: 43 g/L < 50 g/L

a. First and Second Coats:

1) Sherwin-Williams Pro Mar 200 Zero VOC Acrylic Semi-Gloss (B31W2600) (4 mils wet, 1.4 mils dry per coat).
VOC: 0 g/L < 50 g/L.

2. Gypsum Drywall Systems:

a. Egg-Shell Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

b. Texture

1) USG Sheetrock Brand Wall and Ceiling Spray Texture (Multipurpose) (fine orange peel).

2) Texture Additive: Sheetrock Brand First Coat: Add at a rate of 1 gal. per bag of texture-substitute for 1 gal. of water.
VOC: 2 g/L.

c. Primer:

1) Sherwin-Williams Pro Mar 200 Zero VOC Primer B28W2600 (4 mils wet; 1.3 mils dry)
VOC: 43 g/L < 50 g/L

d. First and Second Coats:

1) Sherwin-Williams Pro Mar 200 Zero VOC Interior Latex Eg-Shel B20W2600 (4 mils wet, 1.7 mils dry per coat).
VOC: 41 g/L < 50 g/L.

C. Metals

1. Ferrous Metals:

   a. Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

   b. Primer:

      1) Sherwin-Williams Pro-Cryl Universal Water Based Primer (B66-310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry).
      VOC: Unreduced 89 g/L < 250 g/L.

   c. First and Second Coats:

      1) Sherwin-Williams Pro Industrial 0 VOC Acrylic Semi-Gloss (B31 Series) (4 mils wet, 1.4 mils dry per coat).
      VOC: 0 g/L < 50 g/L.

2. Zinc Coated Metals:

   a. Semi-Gloss Acrylic Enamel: 2 coats on properly prepared surface:

   b. Primer

      1) Sherwin-Williams Pro-Cryl Universal Water Based Primer (B66-310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry).
      VOC: Unreduced 89 g/L < 250 g/L.

   c. First and Second Coats:

      1) Sherwin-Williams Pro Industrial 0 VOC Acrylic Semi-Gloss (B66 W611) (4 mils wet, 1.4 mils dry per coat).
      VOC: 0 g/L < 50 g/L.

3. Ferrous Metal Handrails and Guardrails:

   a. Handrails:

      1) Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface.

      2) Primer:

         a) Sherwin-Williams Pro-Cryl Universal Water Based Primer (B66–310 Series) (5.0-10.0 mils wet, 2.0-4.0 mils dry). VOC: Unreduced 110 g/L < 200 g/L.

      3) First and Second Coats:

a) Sherwin-Williams Pro Industrial 0 VOC Acrylic Semi-Gloss (B66W611) (4 mils wet, 1.4 mils dry per coat). VOC: 0 g/L < 50 g/L.

D. Wood (Trim) Painted

1. Semi-Gloss Acrylic Enamel: 2 coats over primer on properly prepared surface: Verify all fasteners are set below the surface of the wood. Apply wood filler, compatible with paint, to all exposed indentations. Sand smooth.

2. Primer:

a. Sherwin-Williams Premium Wood and Wall Primer (B28W08111) (3 mils wet, 1.3 mils dry)

b. Sand prime coats with 220 grit sand paper.
VOC: 36 g/L < 200 g/L.

3. First and Second Coats:

a. Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss (B31 Series) (4.0 mils wet, 1.4 mils dry per coat).
VOC: 144 g/L < 150 g/L.

E. Wood (Trim) Clear wood finish:

1. Polyurethane, Satin: 2 coats. Verify all fasteners are set below the surface of the wood. Apply wood filler to all exposed indentations. Sand smooth.

2. First and Second Coats:

a. Sherwin-Williams Wood Classics Waterborne Polyurethane Varnish (A68 Series) (3.2 -4 mils wet; 0.8-1.0 mils dry per coat)
VOC: Satin 309 g/L < 350 g/L.

F. Wood (Stained) with clear polyurethane varnish

1. Stain: One coat of MINWAX Low VOC Wood Finish. Stain color as selected by Architect. VOC: 250 g/L = 250 g/L.

2. First and Second Coats:

a. MinWax 250 Waterbased Varnish (3.2 -4 mils wet; 0.8-1.0 mils dry per coat) VOC: Satin 309 g/L < 350 g/L.

G. Exposed Concrete Floors and Curbs in HVAC rooms:

1. Waterbased Urethane Finish: 2 coats over primer on properly prepared surface with anti-slip additive. Prepare concrete surfaces in accordance with SSPC-SP13/NACE 6.

2. Primer:
   a. Sherwin-Williams ArmorSeal Water Based Epoxy Primer (B70AQ11, B60VQ11) (6.0-8.0 mils wet; 5.0-7.0 dry).
   VOC: <20 g/L < 200 g/L.

3. First and Second Coats:

   a. Sherwin-Williams ArmorSeal Armor-Plex Water Based Urethane (B65-750, B65V750), (3.5-5.0 mils wet, 2.0-3.0 mils dry per coat).

   b. Anti-slip additive: H&C SharkGrip added to the coating.
   VOC: Unreduced < 50 g/L < 150 g/L.

H. Masonry

1. Concrete Masonry Units:

   a. Semi-Gloss Acrylic Enamel: 2 finish coats over primer on properly prepared surface:

   b. Primer:

      1) Sherwin-Williams PrepRite Block Filler (B25W25) (16 mils wet, 8 mils dry) VOC: 45 g/L.

   c. First and Second Coats:

      1) Sherwin-Williams ProClassic Waterborne Acrylic Semi-Gloss (B31 Series) (4 mils wet, 1.4 mils dry per coat).
      VOC: 144 g/L < 150 g/L.

3.08 CONSTRUCTION WASTE

A. Comply with Section 01 74 19-Construction Waste for management for reuse, salvage or recycle non-hazardous waste material.

3.09 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 10 14 00
SIGNAGE

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Signage Work, as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Building Identification Signage.

2. Entrances Door Signage.

3. Interior-Room Identification Signage.

4. Barrier Free Signs.

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Cast-In-Place Concrete Work - Section 03 30 00.

2. Unit Structural Masonry - Section 04 23 00.

3. Finish Carpentry - Section 06 20 00.

4. Aluminum Framed Entrance and Storefronts - Section 08 41 13.

5. Paints and Coatings - Section 09 90 00.

6. Toilet Compartments - Section 10 21 13.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

A. Requirements of Regulatory Agencies: Furnish all signs in accordance with the laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect's review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer's printed specifications and/or instructions, the Architect's Drawings and Specifications, and as directed by the Architect.

B. Single Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

C. Design Criteria: The Drawings indicate size, profiles, dimensional requirements and graphics layout of signs and are based on the specific type and/or model indicated. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

1.04 SUBMITTALS

A. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner's Representative and the General Contractor for review.

B. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

C. Shop Drawings: Prepare and submit fully detailed drawings of all items specified herein.

D. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.

E. Samples: Submit 4" x 4" color Samples on materials to be used for fabrication. Written approval shall be secured from the Architect. Installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes, and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Materials shall be stored at the site off the ground and in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

PART 2 - PRODUCTS

2.01 Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 BUILDING IDENTIFICATION SIGNAGE

A. Manufacturer: Signage specified herein shall be as manufactured by Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963, (800)825-0150; www.allendiv.com, or other comparable manufacturer and equivalent product subject to review by the Architect.

B. General: Provide complete and coordinated signage with maximum flexibility and use of manufacturer's standards. Design effect shall maintain overall continuity of color, letter style, and shape as specified herein.

C. Graphic System: Allenite-Architectural Sign Systems, "System 1700 - Vinyl Lettered Signs & Vinyl Letters", computer-cut, pressure sensitive and pre-spaced strips. System shall be forward or reverse cut as selected by the Architect.

1. Sign Address Numbers or Letters: 4" high (unless otherwise directed by local authorities), "Helvetica Medium" Style; as noted on drawings.

2. Colors: As selected by Owner and to comply with the Texas Accessibility Standards.

3. Mounting: Pressure sensitive material with manufacturer's adhesive.

4. Address Numbers: Suitable for mounting above building's aluminum front entrance doors.

D. Exterior Signs Required: Sign titles and quantities include, but are not necessarily limited to the following.

1. Building Fronts: Addresses as required by the Fire Marshall.
2. As noted on the drawings.

2.03 ALUMINUM/GLASS ENTRANCE DOOR SIGNAGE

A. Manufacturer: Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963, (800)825-0150; www.allendiv.com, or other comparable manufacturer and equivalent products subject to review by the Architect.

B. Graphic System: Allenite-Architectural Sign Systems, “System 1700 - Vinyl Lettered Signs & Vinyl Letters”, computer-cut, pressure sensitive and pre-spaced strips.

C. Door Signage:

1. International Symbol of Accessibility Signs: 3" square, contrasting blue background and white graphics, with matte non-glare finish.

2. Egress Signage: Each storefront door sign shall have “Helvetica Medium Style” white letters not less than 1 inch high on a contrasting black background.
   a. Wording: Sign shall read “THIS DOOR MUST REMAIN UNLOCKED DURING NORMAL BUSINESS HOURS”.

2.04 INTERIOR-ROOM IDENTIFICATION SIGNAGE

A. Manufacturer: Signage specified herein shall be signs as manufactured by Innerface Architectural Signage, Inc., 5320 Webb Parkway, Lilburn, GA 30247, (770)921-5566, **www.interface-signage.com.**

B. Comparable Products: Manufacturers with comparable equivalent signage may be acceptable, subject to conformance with these Specifications and review by the Architect and/or Owner.

C. Sign Type: Engraved Plate Signage. Signs shall be Plaque Modules, suitable for wall mounting or hung from the ceiling. Verify mounting condition and location with Tenant.

1. Construction: Signs shall have raised graphic symbols and letters and ADA-compliant Grade 2 Braille as an integral part of the material. Signs shall be contrasting two-color, scratch-resistant, non-static, fire-retardant, washable material with a non-glare matte finish surface, unframed, with finished edges and round corners.

2. Colors: Royal Blue background with White lettering. Color to be verified with Tenant.

3. Sizing: For “bidding purposes”, verify final size with Tenant.

4. Room Signs: 7" x 7", module 4.0 with insert.

5. Mounting: Factory prepared with 1/16" thick vinyl foam tape or mounting holes for use with mechanical fasteners, subject to review by the Architect and/or Owner. General area signs may be hung from ceiling as determined by Tenant.

D. Room Signs Required: Sign titles and quantities include but are not necessarily limited to the following. Verify final number of signs, titles, and room numbers with the Tenant.

1. Classroom (5 required).

2. IT Room (1 required).

3. Mechanical Room (1 required).

4. Cafetorium (1 required).

5. Women’s Restroom (2 required).

6. Men’s Restroom (2 required).

7. Office (3 required)

8. Administration Office (1 required)

9. Reception (1 required)

10. Breakroom (2 required)

E. Lettering Style: Raised 1/32 inch upper case Helvetica medium

F. Accessibility Requirements: Facilities and elements required to be identified as accessible shall include the International Symbol of Accessibility pictogram with verbal description, and Grade 2 Braille. Signage shall comply with applicable provisions of Title III of ADA, Article 4.30 within Appendix A to Part 36 of 28 CFR. Field area size shall be in accordance with governing code requirements for accessibility and use by persons with disabilities.

2.05 BARRIER FREE SIGNS

A. Manufacturer: Signage specified herein shall be as manufactured by Seton Identification Products, 20 Thompson Road, P.O. Box 819, Branford, CT 06405-0819, (800)571-2596 or (203)488-8059; www.seton.com.

B. Comparable Products: Comparable equivalent signage by the following company or other comparable manufacturer's product may be acceptable, subject to conformance with these Specifications and the Architect's review.

1. Allen Markings, 1130 Elmwwod Avenue, Kansas City, MO 64127, (816)842-0963 or (800)825-0150; www.allendiv.com.

C. Decal Signs: Barrier free signs at toilet partitions designated for individuals with a disability shall be Seton "Handicap Symbol Decal", Item #35839, tear-resistant, self-adhesive vinyl single sided decal.

1. Graphics: International Symbol Accessibility sign shall have contrasting blue background and white graphics, with matte non-glare finish.

2. Size: 4" x 4".

2.06 VINYL LETTERED SIGNAGE

A. Manufacturer: Allen Markings, 1130 Elmwood Avenue, Kansas City, MO 64127, (816)842-0963, (800)825-0150; www.allendiv.com, or other comparable manufacturer and equivalent products subject to review by the Architect.
- Refer Interior Elevations and Construction Documents for additional vinyl signage to be applied at the front door for Hours of Operation, etc.

B. Graphic System: Allenite-Architectural Sign Systems, "System 1700 - Vinyl Lettered Signs & Vinyl Letters", computer-cut, pressure sensitive adhesive and pre-spaced strips.

C. Front Doors:

1. Letters: 2" high, for Hours of Operation. Refer drawings. Coordinate color and locations with the tenant.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 – Execution

3.02 INSTALLATION

A. General: Furnish and install products as shown on the Drawings and specified herein. Special attention shall be given to, but not necessarily limited to the following:

1. Exterior Building Identification Signage: Install signs as indicated and/or shown on the Drawings.

2. Aluminum/Glass Entrance Door Signage: All accessible public entrance doors shall be provided with “International Symbol of Accessibility Signs” and “Egress Signage” as specified herein.

    a. International Symbol of Accessibility Signs: Graphics shall be readable from exterior side of door.

    b. Egress Signage: Apply signage so that wording is readable from interior face side of storefront door.

    c. Surface Conditions: Apply signage on clean surfaces, flat and smooth without ripples or air bubbles.

    d. Compliance with Local Authorities: Signage shall be located as required by local authorities.

3. Interior-Room Identification Signage: Install signs as indicated and/or shown on the Drawings.

4. Barrier Free Signs: Install signs for toilet compartment/partition stall doors where indicated on the Drawings for individuals with a disability.

5. General Area Sign: Install signs in locations as directed by Tenant.

6. Vinyl Lettered Signage: Install numbers and letters in locations as directed by Tenant.

B. Accessory Materials: Provide all accessory materials required and necessary for complete and finished installations.

C. ADA Accessibility Guidelines: Signage required to be with accessible designation shall comply with “Mounting Location and Height” specified within the provisions of Article 4.30 of the ADA Accessibility Guidelines.

D. Protection: Protective covers provided by the manufacturer to protect the finishes shall not be removed until final cleaning.

3.03 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

1. Coordinate color and locations with the tenant.

END OF SECTION

SECTION 10 21 13.13
FLOOR MOUNTED TOILET PARTITION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes
Furnish, deliver and install all Toilet Partitions as indicated on the drawings and as required by actual conditions at the building. The Toilet Partitions shall include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields and all other devices necessary for the proper installation and application of the Toilet Partitions.

B. Related Sections
Section: 10500 Lockers
Section: 10800 Washroom Accessories

1.02 REFERENCES

A. Standard
All Toilet Partitions must be scheduled, supplied and installed in accordance with: Local Building Code, CGSB (Canadian Government Specifications Board), CSA (Canadian Standards Association), ANSI (American National Standards Institute), ADA (Americans with Disabilities Act). In all cases the above references shall be taken to mean the latest edition of that particular standard including all revisions.

1.03 SUBMITTALS

A. General Requirements
Make all submittals in accordance with Section: 01 30 00

B. Schedules
1. Submit (4) copies of detailed shop drawings and in PDF Format for the Consultant's/Owner's review within (2) weeks of being awarded this subcontract.

C. Product Data
1. Submit (2) copies of product sheets and/or catalogue cuts and in PDF format, of all products listed in the shop drawings.

D. Samples

1. Upon request, a returnable sample of the Toilet Partitions shall be submitted to the Consultant/Owner for approval not later than (10) days after requested. All samples must be properly identified including: name of supplier, and name of manufacturer.

E. Operations and Maintenance Data

1. At completion of the job, furnish to the owner (2) copies of an Owners Operation and Maintenance Manual. The Manual shall consist of a hard cover three ring binder with the project name in the front. Include in the manual the following information: Maintenance instructions, Catalogue pages for each product, Name/Address and phone number of the Manufacturer and their Sales Agent, Copy of the final shop drawings.

1.04 QUALITY ASSURANCE

A. Substitutions

1. Manufacturers and model number listed are to establish a standard of quality. Similar items by approved manufacturers that are equal in design, function, quality and finish may be accepted upon prior written approval from the Architect/Owner.

2. All requests for acceptable substitutions must be made in writing and submitted to the Architect at least 14 days prior to tender closing. If requested, all requests for substitutions must be accompanied by product literature and actual product samples.

B. Supplier Qualifications

1. Toilet Partition shop drawings and Toilet Partitions shall be procured from a source of supply approved by the Consultant/Owner/Architect. Supplier is responsible for the complete Toilet Partition subcontract.

1.05 DELIVERY, STORAGE AND HANDLING

A. Marking and Packaging

1. Toilet Partitions must be delivered to the job site in the manufacturers' original packages and marked to correspond with the approved shop drawings.

B. Delivery

1. Toilet Partitions must be delivered in an amount of time deemed appropriate by the Consultant/Owner.

1.06 WARRANTY

A. Written Guarantee

1. The Toilet Partition manufacturer shall guarantee all Toilet Partitions by written certification, for a period of (3) years from date of receipt by customer, against any defects in design, materials and workmanship.

1.07 MAINTENANCE

A. Maintenance

1. Upon request, at completion of the project, the Toilet Partition supplier may be required to brief Owner's maintenance staff regarding proper care of Toilet Partitions, such as: required lubrications, adjustments, cleaning, etc...

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturers

Only those manufacturers names and product numbers listed herein, are approved for use on this project. All other manufacturers must request approval as per section (1.04 - A - Substitutions). Absolutely no variations from listed and pre-approved items will be permitted.

Approved manufacturer(s):
1. Hadrian Manufacturing, Inc.

2.02 MATERIALS

A. Construction: Doors, Panels and Pilasters shall be constructed of two sheets of panel flatness zinc-coated steel, Galvanneal ASTM A653 GR33, laminated under pressure to a honeycomb core for sound deadening and rigidity. Formed edges to be welded together and inter-locked under tension with a roll-formed oval crown locking bar, mit14red, welded and ground smooth at the corners. Honeycomb to have a maximum 25mm (1") cell size.

B. Doors: Shall be 25mm (1") thick with cover sheets not less than 22-gauge (0.8mm).

C. Panels: Shall be 25mm (1") thick with cover sheets not less than 22-gauge (0.8mm).

D. Pilasters: Shall be 32mm (1.25") thick with cover sheets not less than 18-gauge (1.2mm).

E. Hardware and Fittings: All panel and pilaster brackets and all door hardware shall be chrome plated zinc die castings. Fasteners are zinc plated 12 x 1-3/4” and 12 x 5/8” TR-27 6-lobe security screws. Doors shall be equipped with a gravity type hinge mounted on the lower pilaster hinge bracket. Door hinges shall be fully concealed within the thickness of the door and adjustable to permit the door to come to rest at any position when not latched. Each door to be fitted with a combined coat hook and bumper and a concealed latch, with face mortised flush with edge strip of door. Barrier-free doors shall include thumbturn lever to activate latch without fingertip grip application. Both standard and barrier-free latches shall have a turn slot designed to allow emergency access from exterior. The combined stop and keeper shall have a 19mm (0.75") diameter bumper locked in place. Threaded upper hinge pin shall have a metal core and self-lubricating nylon sleeve to ensure smooth, quiet operation. Pilaster shoes shall be a welded one-piece design made from polished stainless steel. Two-piece shoes that can disassemble when kicked are unacceptable.

2.03 FINISH

A. All sheet metal to be thoroughly cleaned, phosphated and finished with a high-performance powder coating, electrostatically applied and oven cured to provide a uniform, smooth protective finish. Color shall be as selected from Hadrian’s color card.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Preparation
1. The contractor must examine all site conditions that would prevent the proper application and installation of Toilet Partitions. Any defect must be immediately identified and corrected, prior to the installation of the Toilet Partitions.

3.02 INSTALLATION

A. Mounting Locations
1. All Toilet Partitions must be mounted according to Manufacturers standard locations and those specified on the drawings.

3.03 FIELD QUALITY CONTROL

A. Inspection
1. After installation has been completed, provide for a site inspection of all Toilet Partitions to determine that all items have been supplied and installed as per the enclosed details. Also, check the operation and adjustment of all Toilet Partitions. Any discrepancies, or malfunctioning product, must be reported to the Architect immediately.

3.04 ADJUSTMENT AND CLEANING

A. Final Preparation
1. At final completion, Toilet Partitions shall be left clean and free from disfigurement. Make all final adjustments. Where Toilet Partitions are found defective, repair or replace or otherwise correct as directed.

3.05 PROTECTION

A. Site Protection
1. The Contractor must provide for the proper protection of all Toilet Partitions until the owner accepts the project as complete.

3.06 TOILET PARTITION SCHEDULE

A. Schedule
1. Provide Toilet Partitions as specified in all above sections and as per the detailed Architectural Drawings.

END OF DOCUMENT

SECTION 10 26 13
FLEXIBLE CORNER GUARDS

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SUMMARY
A. Corner guard system for wall protection

1.02 SECTION INCLUDES
A. Flexible Corner Guards

1.03 REFERENCES
A. American Society for Testing and Materials (ASTM)
B. National Fire Protection Association (NFPA)
C. Society of Automotive Engineers (SAE)

1.04 SYSTEM DESCRIPTION
A. Performance Requirements: Provide corner guard systems that conform to the following requirements of regulatory agencies and the quality control of IPC Door and Wall Protection Systems, InPro Corporation.
1. Fire Performance Characteristics: Provide corner guards conforming with NFPA Class B fire rating. Surface burning characteristics, as determined by ASTM E-84, shall be flame spread of 55 and smoke development of 375.
2. Color Consistency: Provide components matched in accordance with SAE J-1545 - (Delta E) with a color difference no greater than 1.0 units using CIE Lab, CIE CMC, CIE LCh, Hunter Lab or similar color space scale systems.

1.05 SUBMITTALS
A. Product Data: Manufacturers printed product data for each type of corner guard specified.
B. Detail Drawings: Mounting details with the appropriate adhesives for specific project substrates.
C. Samples: Verification samples of corner guard, 8" (203mm) long, in full size profiles of each type and color indicated.
D. Manufacturers Installation Instruction: Printed installation instructions for each corner guard.

1.06 DELIVERY, STORAGE AND HANDLING
A. Deliver materials in unopened factory packaging to the jobsite
B. Inspect materials at delivery to assure that specified products have been received.
C. Store in original packaging in a climate controlled location away from direct sunlight.

1.07 PROJECT CONDITIONS
A. Environmental Requirements: Products must be installed in an interior climate controlled environment.

1.08WARRANTY
A. Standard IPC Limited Lifetime Warranty against material and manufacturing defects.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: IPC Door and Wall Protection Systems,
InPro Corporation, PO Box 406 Muskego, WI 53150 USA;
Telephone: 800-222-5556, Fax: 888-715-8407,
Internet address: http://www.inprocorp.com

B. Substitutions: Not permitted

C. Provide all corner guards and wall protection from a single source.

2.02 MANUFACTURED UNITS

A. Corner Guard Profile

1. Flexible Corner Guards to be IPC Door and Wall Protection, Flexible Corner Guards in 8’ foot lengths.

2.03 MATERIALS

A. Vinyl: Corner guard of .110" (2.8mm) thickness shall be extruded from chemical and stain resistant Biopolymer Flex PVC.

2.04 COMPONENTS

A. Attachments

1. Adhesive: Field applied heavy-duty adhesive.

2.05 FINISHES

A. Vinyl: Colors of the corner guard to be selected by the architect from the IPC Door and Wall Protection standard finish selection. Surface shall be smooth.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas and conditions in which the corner guard systems will be installed.

1. Complete all finishing operations, including painting, before beginning installation of corner guard system materials.

B. Wall surface shall be dry and free from dirt, grease and loose paint.

3.02 PREPARATION

A. General: Prior to installation, clean substrate to remove dust, debris and loose particles.

3.03 INSTALLATION

A. General: Locate the corner guard as indicated on the approved detail drawing for the appropriate substrate and in compliance with the IPC installation instructions. Install corner guard level and plumb at the height indicated on the drawings.

B. Installation of Flexible Corner Guards:

Material must be stored, installed and used in environmentally controlled conditions

1. Allow the corner guards to reach room temperature before installing. The wall surface that the corner guards are to be applied must be dry and free of dirt, dust, oil, loose paint, wax and grease. Twelve-foot corner guards may be folded for shipment via UPS. Allow the corner guards to lie flat for 24 hours before installation. Additional bracing may be required during installation to insure complete contact with the wall.

2. Use IPC #535 Heavy-Duty Adhesive to adhere corner guards.
   a. Apply a bead of IPC #535 Heavy-Duty Adhesive in a zig zag pattern over the back of the corner guard.
   b. Immediately position the corner guard on the wall and apply pressure until a tight fit is achieved. An extension roller will aid this step.
   Adhesive coverage: One 10.6 oz. Cartridge of #535 Heavy-Duty
   Adhesive will adhere the following corner guards based on an approximate coverage of 70 lf per cartridge.
   Model# Number of Corner Guards per cartridge
   3436F, 436135F, 11236F, 236135F - 11
   3448F, 448135F, 11248F, 248135F - 8
   3496F, 496135F, 11296F, 296135F - 4
   3409F, 409135F, 11209F, 209135F - 3
   3412F, 412135F, 11212F, 212135F - 3

3.04 CLEANING

A. At completion of the installation, clean surfaces in accordance with the IPC clean-up and maintenance instructions.

END OF SECTION

SECTION 10 28 13
TOILET ACCESSORIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide Toilet Accessories Work as indicated on the Drawings and specified herein. Work includes, but is not necessarily limited to the following:

1. Grab Bars.
2. Tissue Dispenser.
3. Framed Wall Mounted Mirrors.
4. Sanitary Napkin/Tampon Dispensers.
5. Sanitary Napkin Disposals.
6. Electric Hand Dryer
7. Wall Mounted Recessed Soap Dispensers.
8. Counter Mounted Soap Dispensers.
9. Paper Towel Dispenser and Waste Receptacle Units.
10. Disposable Seat Cover Dispensers.
11. Insulation Kits for Lavatories with Exposed Piping.
12. Mop – Hook.
13. Diaper Changing Station
14. Clothes/Towel Hook.
15. Accessible Signage

B. Related Sections: The following items of related Work will be provided under other sections of the Specifications, as indicated:

1. Rough Carpentry - Section 06 10 00.

2. Finish Carpentry - Section 06 20 00.

3. Gypsum Wallboard - Section 09 29 00.

4. Thin-Set Tile Work - Section 09 31 00.

5. Solid Plastic Toilet Compartments - Section 10 21 16.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

A. Requirements of Regulatory Agencies: Furnish toilet accessories in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans With Disabilities Act (ADA), Public Law 101-336 and the Texas Accessibility Standards.

1.03 QUALITY ASSURANCE

A. Heavy Duty Construction: Provide where applicable, product and material accommodations with reinforcements suitable for obesity clinic patients weighing 400 pounds.

1.04 SUBMITTALS

A. General: Submit Shop Drawings, Product Data, and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

B. Shop Drawings: Submit fully detailed layout and setting drawings, illustrative plates or drawings, and Supplementary Shop Drawings of all items.

C. Samples: Submit 4" x 4" Samples of colors and/or finishes specified herein, for approval PRIOR to installation. Written approval shall be secured from the Architect, and installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Materials shall be stored at the site, off the ground in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Lead Time: When phenolic and plastic laminated products are specified, allow not less than six (6) weeks lead time.

D. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

B. Stainless Steel Framed Mirrors: In addition to the above warranty, the stainless steel framed mirror manufacturer shall provide industry standard of not less than a fifteen (15) year written guarantee against glass mirror silver spoilage.

PART 2 - PRODUCTS

2.01 TOILET ROOM ACCESSORIES - GENERAL

A. Manufacturer: Unless otherwise noted, items specified herein represent commercial quality products manufactured by the following manufacturer, and illustrate the type, function, size, operation, material, finish and constructions required.

1. Bobrick Washroom Equipment, Inc., 11611 Hart Street, North Hollywood, CA 91605-5882, (800)553-1600, (818)982-9600 or (818)764-1000; ww.bobrick.com.

B. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

C. Material and Finish: Unless otherwise specified, all items shall be of Type 304 stainless steel with satin finish.

D. Supplementary Hardware: Furnish each item complete with non-corrosive fasteners, anchorage, trim, and back-up plates as required for securing to walls (masonry and/or drywall). Furnish all incidental parts.

E. Fasteners: Provide vandal-resistant fasteners wherever exposed fasteners are required.

F. Locks: Toilet room accessories equipped with tumbler locks shall be keyed alike with all other locked toilet room accessories, with the exception of coin boxes in vending equipment. All tumbler locks shall be fastened to accessories with lock nuts. Fastening locks to units with spring clips is not acceptable.

G. Product Identification Labels: Products shall have either a printed waterproof label or stamped nameplate indicating manufacturer's name and product model number. Identification labels shall not be on the exposed finish surface of the product.

2.02 TOILET ROOM ACCESSORIES

A. Grab Bars: BOBRICK 5806 (Refer to dwgs for length required) 1-1/2" diameter, knurled finish, concealed mounting.

B. Toilet Paper Dispensers: Owner Provided, Contractor Installed.

C. Wall mounted Framed Mirrors: Bobrick B-165 series, stainless steel, framed. (Refer to dwgs for required sizes).

D. Sanitary Napkin/Tampon Dispensers: Refer drawings for mounting heights. Owner Provided.

E. Surface-mounted Sanitary Napkin Disposals: Bobrick Contura Series B-270

F. Soap Dispensers: Mounted Soap Dispenser Model #B-822.

G. Paper Towel Dispensers. Refer drawings for mounting heights. Owner Provided, Contractor Installed.

H. Waste Receptacle Units. Refer drawings for mounting heights. Owner Provided.

I. Toilet Seat Cover Dispensers: All welded construction. Dispensers shall be suitable for dispensing standard single-fold or half-fold paper toilet seat covers from beveled opening.

1. Surface-Mounted Dispensers: Bobrick model B-221

J. Surface-Mounted Dryer: Saniflow Machflow Model No.: M09-UL and KT009CS ADA Recessed Kit.

K. Vertical Wall-Mounted Baby changing station: Bobrick model KB101-00.

L. Insulation Kits: Lavatories with exposed piping shall be provided with Protective Undersink Piping Covers, specified herein, complete with all accessories required and as required by TAS. Comparable equivalent manufacturer's product, subject to review by the Architect.

1. Manufacturer: IPS® Corporation, 500 Distribution Parkway, Collierville, TN 38017, (800)888-8312 or (901)853-5001; www.truebro.com.

2. Undersink Protective Pipe Covers: ADA-compliant (Article 4.19.4), wheelchair accessible lavatory P-trap and angle valve assemblies shall be covered with molded vinyl, antimicrobial. TRUEBRO® - LAV GUARD® 2 E-Z Series waste and supply piping undersink pipe covers. Cover shall have internal trim feature for square and clean trimming, internal rib fasteners, and built-in, concealed fasteners (cable-tie fasteners shall not be permitted).

   a. Material: Soft, resilient molded vinyl.

   b. Nominal Wall: 1/8" constant with internal ribs.

   c. Trimming (E-Z Series): Internal E-Z Tear-To-Fit trim feature for installation without tools.

   d. Fasteners (E-Z Series): Internal E-Z Grip fasteners, reusable.

   e. Paintability: Material shall be paintable with latex paint where required by Drawings and/or field conditions to match adjacent material colors.

   f. Burning Characteristics: Self extinguished 0 sec (ATB) mm (AEB), in accordance with ASTM D635 - Standard Test Methodd for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

   g. Bacteria/Fungus Resistance: In accordance with ASTM G21 - Standard Practice for Determing Resistance of Synthethic Polymeric Materials to Fungi. Result: 0 growth.

   h. Color: Manufacturer's standard "China White", subject to approval by the Tenant, Architect and/or Owner.

3. Compatibility: Contractor shall coordinate with Plumbing Contractor for compatible complete design kit series required to fit piping assemblies.

M. Mop Hangers/Hook: Bobrick Stainless steel, 48 inches long with 4 holder. Mop-Broom Holder Model No. B-223.

N. Paper Tower Dispensers (for break room area and kitchen): Bobrick Classic Series Surface Mounted Paper Towel Dispenser, Model No. B-262

P. Coat Hook with Bumper: Bobrick Model No. B-212

Q. Towel Pin: Bright-polished stainless steel Towel Pin Bobrick B-677.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSPECTION

A. Check wall openings for dimensions, plumbness of blocking or frames that would affect installation of recessed accessories. For surface mounted accessories check condition of wall and confirm installation of backing within wall.

B. Verify spacing of plumbing fixtures and toilet compartments that affect installation of toilet room accessories.

3.03 INSTALLATION

A. General:

1. Comply with ADA and code requirements for facilities for individuals with a disability. Should governing code requirements differ from any specified herein, the more stringent requirement shall be met.

2. Protective covers installed by manufacturers to protect the finishes, shall not be removed until final cleaning.

B. Locations and Methods of Installation: Install accessories at locations and heights indicated on the Drawings, straight, plumb and level and in accordance with manufacturer’s installation instructions. Install items with non-corrosive anchoring devices. Installation methods shall conform to manufacturer’s recommendations for backing and proper support. Conceal evidence of drilling, cutting, and fitting to room finish. Fit flanges of accessories snugly to wall surfaces.

C. Grab Bars: Mount grab bars to walls and partitions with supplied flanges and fasteners. Installed grab bars shall be anchored so as to withstand a force of not less than 300 pounds for five (5) minutes in any direction.

D. Lavatory Insulation Kits: Install on exposed piping at each lavatory.

3.04 FIELD INSPECTION

A. Toilet Room Accessories: Engage the services of the approved manufacturer's inspection service, to inspect the installation of all Toilet Room accessories specified herein, and report any installation adjustments required to place all accessories in perfect working order, at no cost to the Owner.

3.05 MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with all manufacturer's printed data, including service and parts manual, necessary for proper cleaning and maintenance of the products specified herein.

3.06 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

The requirements of the “General Conditions”, the “Supplementary Conditions”, and “Division 1” sections of the Specifications, shall apply to this section of the Specifications.

PART 1 - GENERAL

1.01 SCOPE

A. Work Included: Provide all labor, materials, equipment, apparatus, tools, transportation, protection and services necessary for, and reasonably incidental to the proper execution and completion of all Fire Protection Specialties Work, as indicated on the Drawings and/or specified herein. Work includes, but is not necessarily limited to the following:

1. Portable Fire Extinguishers and Accessories.

1.02 REFERENCE SPECIFICATIONS, CODES, AND APPLICABLE STANDARDS

A. Requirements of Regulatory Agencies: Furnish miscellaneous accessories in accordance with laws, codes, ordinances and regulations of the public authorities having jurisdiction, including Title III of The Americans with Disabilities Act (ADA), Public Law 101-336.

1.03 QUALITY ASSURANCE

A. General: All materials, articles, accessories incorporated in the Work shall be type and quality specified herein, and subject to the Architect’s review. Methods of preparation, construction and installation of such materials, articles and accessories shall be strictly in accordance with the accepted standard practices, manufacturer’s printed specifications and/or instructions, the rchitect’s Drawings and Specifications, and as directed by the Architect.

B. UL-Listed Products: Fire extinguishers shall meet Underwriters Laboratories Inc., UL 299 UL Standard for Safety Dry Chemical Fire Extinguishers.

1.04 SUBMITTALS

A. Reports: Submit test reports, procedure specifications and certifications as required to substantiate welded connections design and welding qualifications to the Owner’s Representative and the General Contractor for review.

B. General: Submit Shop Drawings, Product Data and Samples to the Architect for review in accordance with the requirements in Section 01 33 23 - Shop Drawings and Samples, and as specified herein.

C. Shop Drawings: Submit fully detailed layout and setting drawings, illustrative plates or drawings, and Supplementary Shop Drawings of all items.

D. Samples: Submit 4" x 4" Samples of fire extinguisher cabinets colors and/or finishes specified herein, for approval PRIOR to installation. Written approval shall be secured from the Architect, and installed materials shall match approved Samples.

1.05 MATERIAL DELIVERY AND STORAGE

A. Delivery: Deliver only acceptable materials to the site in original boxes, crates, and wrappings, clearly labeled with all pertinent information to facilitate checking.

B. Storage: Materials shall be stored at the site, off the ground in properly protected dry storage facilities, until ready for use. Damaged materials will not be acceptable, and shall be removed from the site.

C. Packaging Waste Management: Separate packaging waste materials for reuse, recycling and/or landfill.

1.06 WARRANTY

A. Form of Warranty: Execute a warranty in the approved written form, warranting all materials and workmanship to remain in serviceable and satisfactory condition, and to make good at own expense any imperfections which may develop during the warranty period, and any damage to other Work caused by imperfections or by repairing imperfections. The warranty period shall be not less than one (1) year from date of Owner's acceptance.

B. Fire Extinguishers: In addition to the above warranty, the fire extinguisher manufacturer shall provide industry standard of not less than a six (6) year written warranty covering materials and workmanship, at no charge to the Owner.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer: Fire Extinguishers and Accessories and Fire Extinguisher Cabinets specified herein shall be as manufactured by Larsen's® Manufacturing Company, 7421 Commerce Lane N.E., Minneapolis, MN 55432, (763)571-1181 or (800)527-7367; www.larsensmfg.com.

B. Substitutions: Manufacturers with comparable equivalent products may be acceptable, subject to conformance with these Specifications, the requirements of the Drawings, and the Architect's review. Refer to Specification 01 25 00 – Substitution Procedures.

2.02 PORTABLE FIRE EXTINGUISHERS

A. Fire Extinguishers: Larsen's®, HT Series, Halotron I, Model Number HT11 extinguishers.

1. Type: Extinguishers as specified herein shall be portable, hand-carried type, pressurized EPA approved clean agent fire extinguishers, 5-pound nominal capacity, with self-closing hand valve, discharge hose, pressure gauge, in manufacturer's standard container with corrosion and impact resistant polyester/epoxy "red" paint finish. UL Rating 4A-80B: C for Class A, B, and C fires. Units shall contain Halotran I.

2. Miscellaneous Requirements: Furnish test, refill schedules, procedures, and recertification requirements in accordance with National Fire Protection Association, NFPA 10 - Standard for Portable Fire Extinguishers, latest edition.

B. Fire Marshal's Approval: Size, type, and quantities of fire extinguishers as indicated on the Drawings and/or specified herein shall be subject to review and approval by the Fire Marshal.

C. Accessories:

1. Mounting Brackets: Provide manufacturer's recommended and compatible standard mounting extinguisher brackets and anchors. Brackets shall be of size and design to accommodate the accepted manufacturer's fire extinguishers.

2. Signage: Provide signs identifying the locations of fire extinguishers as required by local authorities.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Refer to Section 01 31 00 – Project Management & Coordination

B. Refer to Section 01 73 00 - Execution

3.02 INSTALLATION

A. General: Provide products specified herein for installations, as indicated on the Drawings or required.

1. Install items included in this section in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

2. Comply with ADA and code requirements for facilities for individuals with a disability. Should governing code requirements differ from any specified herein, the more stringent requirement shall be met.

3. Fire extinguisher cabinets and mounting brackets for wall hung fire extinguishers shall be securely fastened to structure, square and plumb, and in compliance with manufacturer's instructions.

4. Protective covers installed by manufacturers to protect the finishes, shall not be removed until final cleaning.

B. Fire Extinguishers: Provide portable fire extinguishers for wall mounted installations on mounting brackets, in quantities as required by the Fire Marshal.

1. General: Install fire extinguishers and identifying signs in accordance with local authorities, ADA guidelines, and manufacturer's recommendations, at locations designated by the Fire Marshal.

2. Inspection: Verify servicing, charging and tagging of all fire extinguishers.

3.03 MAINTENANCE INSTRUCTIONS

A. Furnish the Owner with all manufacturer's printed data, including service and parts manual, necessary for proper maintenance of the products specified herein.

3.04 CLEAN-UP

A. Waste Management: Collect field generated construction waste created during construction or final cleaning.

END OF SECTION

DOCUMENT 00 01 07
SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

1.15.2024

MEP ENGINEERS

MEP Solutions Engineering
Texas Registration No. F-9748
Luis Javier Peña, P.E.
Texas Registration No. 97260

The following sections:

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

DIVISION 22: PLUMBING

220510 - PLUMBING GENERAL REQUIREMENTS
220515 - MATERIALS AND METHODS
220529 - HANGERS AND SUPPORTS
220553 - PLUMBING IDENTIFICATION
220713 - PLUMBING INSULATION
221316 - SANITARY WASTE AND VENT PIPING
224250 - PLUMBING SPECIALTIES

DIVISION 23: HEATING, VENTILATING AND AIR CONDITIONING

230510 - MECHANICAL GENERAL REQUIREMENTS
230515 - MATERIALS AND METHODS
230529 - HANGERS AND SUPPORTS
230553 - MECHANICAL IDENTIFICATION
230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713 - HVAC INSULATION
233113 - METAL DUCTS
233300 - DUCT ACCESSORIES
233713 - DIFFUSERS, REGISTERS, AND GRILLES
238130 - DUCT-FREE SPLIT SYSTEMS

DOCUMENT 00 01 07
SEALS PAGE

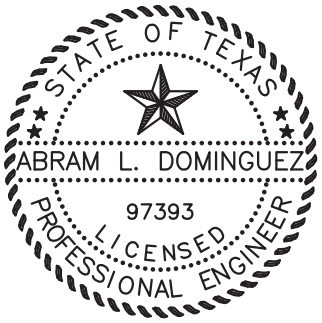
DESIGN PROFESSIONALS OF RECORD

MEP ENGINEERS — MEP Solutions Engineering
Texas Registration No. F-9748
Abram L. Dominguez, P.E.
Texas Registration No. 97393

The following sections:

DIVISION 26: ELECTRICAL

260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
262726 - WIRING DEVICES
262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS



1.15.2024

Abram L. Dominguez

END OF DOCUMENT

MEP SOLUTIONS ENGINEERING
MECHANICAL, ELECTRICAL, PLUMBING ENGINEERS
600 E. BEAUMONT AVE. SUITE 2 McALLEN, TX 78501 (956) 664-2727
TEXAS BOARD OF PROFESSIONAL ENGINEERS REGISTRATION # F-9748

SECTION 22 05 10
PLUMBING GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification Section apply to this and other sections of Division 22.

B. Before submitting his proposal, each bidder shall examine all plans and specifications relating to the work, visit the site(s) of the proposed project, and become fully informed of the extent and character of the work required.

1.2 REFERENCE STANDARDS

A. Perform all Division 22 work in strict accordance with the Laws and Regulations of the State of Texas, and County and City codes/ordinances having jurisdiction over the project.

1.3 COORDINATION

A. Coordinate work under this Division to avoid conflicts and to attain satisfactory and complementary systems.

B. Coordinate work under this Division with work under other Divisions to avoid conflicts and to allow for adequate installation, maintenance, and operating space. Obtain the Architect's approval for penetrations of other parts of the Work prior to affecting them.

C. Prepare coordination drawings in accordance with Division 1 to a scale of ¼"=1'-0" or larger; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow if the work.

1.4 DEFINITIONS

Specific meanings used in Division 22 (variant forms are inferred):

A. Work: This project, or the reference part.

B. Provide:

1. Furnish and install, complete with necessary appurtenances.
2. "Provide" is implied throughout this Division unless language is specific.

C. Required: Required by the contract Documents.

D. Necessary: Necessary in order to obtain a finished system in satisfactory operating condition, and meeting all requirements.

E. Furnish: Procure and deliver, ready for installation, necessary and/or required.

F. Install: Receive, place securely, ready for connection to work specified elsewhere, and bring into satisfactory operating condition, as necessary and/or required.

G. Connect: Connect properly to mechanical work. This includes non-physical “connections” such as indirect waste drains.

H. Architect, Project Architect or Architect/Engineer Team.

1.5 SCOPE OF WORK

A. The work under this Division includes providing complete mechanical systems for the project.

B. All items of labor, material or equipment not required in detail by the specifications or plans, but incidental to, or necessary for the complete installation and proper operation of all phases of work described herein, or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Contract Documents.

1.6 WORKMANSHIP

A. All labor shall be performed in a workmanlike manner by mechanics skilled in their particular trades. All installations shall be complete in both effectiveness and appearance whether finally enclosed or left exposed. The architect reserves the right to direct the removal or replacement of any item which in his opinion shall not present a reasonable neat or workmanlike appearance, providing that same can be properly installed in an orderly way.

1.7 MANUFACTURER’S INSTRUCTIONS

A. All equipment and devices shall be installed in accordance with the plans and specifications, manufacturer’s instructions and applicable codes. Contractor shall obtain written recommendations of installation and start-up instructions from material vendors and comply, unless otherwise required. Bring discrepancies between these instructions and project requirements to the attention of the Architect, and resolve prior to construction. Provide signed inspection report by manufacturer’s representative at system start-up to verify all is in compliant for product warranty.

1.8 WARRANTY

A. The contractor shall warranty his work against defective materials and workmanship for a period of 1-year from date of acceptance of the job.

1.9 TRAINING

A. Upon completion of the work and at a time designated by the Owner’s representative, provide a formal training session for the Owner’s operating personnel to include location, operation, and maintenance of all equipment and systems.

1.10 PERMITS AND FEES

A. Permits: Obtain special permits necessary for this portion of the Work.

B. Fees: Pay any fees associated with permits, required inspections, and permanent utility connections to this part of the work.

1.11 LICENSES

A. Work under this Division shall be performed by organizations and individuals holding a current license to perform such type of work by the authority having jurisdiction. “License” in this sense means any process, regardless of its appellation, which is normally mandated by the authority in order to perform such type of work within its jurisdiction. The stipulation of this paragraph applies even if the work is located physically on property owned or controlled by a higher authority. E.G., to work within the city limits of Corpus Christi, Texas, on a Federal project, State of Texas and City of Corpus Christi licenses which would be mandated to work on a private project shall be required even though the City and State may have no jurisdiction over the higher government.

B. In the event that the licensed organization loses its license or is unable to obtain one, or the licensed individual performing the work becomes unlicensed or deports the organization, notify Architect immediately in writing.

1.12 UTILITY COORDINATION

A. Permanent: Provide all ancillary work necessary to obtain utility connections. Pay connection fees. Arrange for connection in a timely manner. Coordinate time and arrangement of other work with the serving utility, and comply with utility standards.

B. Temporary: Refer to Division 1.

C. General: The contractor shall verify to his own satisfaction the location, elevation and availability of all utilities and services required, and shall adequately inform himself as to their relation to the work. The contractor shall also verify location, conduct all necessary tests, inspections, coordinate with owner’s representatives and utilities, and check or existing underground utilities and lines before ditching. Repair of any cut or damaged lines or utilities shall be the sole responsibility of the contractor.

1.13 LISTING AND LABELING

Materials required to be listed shall be listed and labeled for the particular service if a listing is available. Obtain and comply with the terms of listings. Listed material include.

A. NSF: Potable water and sanitary waste systems components.

B. UL: Electrical materials.

C. AMCA: Air moving devices and related accessory items.

D. ARI: HVAC equipment.

E. FM or UL: Hazardous fluid and fire protection system components.

F. FIA, FM or AGA: Fuel gas system components.

1.14 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new. Products shall be currently manufactured.

B. All materials and equipment shall be clearly marked, stamped or labeled for identification. Do not obscure nameplates. Where manufactures nameplates do not meet the requirements of the identification specification provide nameplates in accordance with the specification.

C. All products of similar type shall be provided by a single manufacturer throughout the project.

1.15 SUBMITTALS AND REVIEW

A. Contractor shall furnish to the Architect, within a reasonable time after award of contract, and prior to commencing any work, complete brochures in quadruplicate (plus quantity required by the Contractor) of all materials and equipment which the contractor proposes to furnish on the project. Data shall include descriptive literature, performance data, diagrams, capacity information, etc., to substantiate that proposed equipment will meet all of the requirements of the plans and specifications.

B. All data must be checked and any required changes noted thereon by the contractor, signed and dated prior to furnishing same to the Architect for approval. Contractor’s attention is directed that it is mandatory that he thoroughly review data prior to furnishing same to assure that equipment is in accordance with plans and specifications and to assure prompt return of the data.

C. Deviations: Specifically call to the attention of the Architect every proposed deviation from the Contract Document requirements. Failure to identify deviations as such constitutes a representation that all requirements are not met.

D. Review: Review of submittals shall not be constructed as releasing the Contractor from responsibility, but rather as a means to facilitate coordination of the work and the proper selection and installation of the products. All work shall be subject to final acceptance by the Architect at the completion of the project.

E. If above information is not provided complete as specified above and within the allocated time, all equipment shall be furnished exactly as specified without any substitutions.

1.16 SUBSTITUTIONS

A. Refer to the Conditions of the Contract.

B. Where one vendor is indicated for a product, it is to establish a level of quality and performance; provide a product equal to that product in all respects from a vendor of equivalent performance.

C. Where multiple vendors are indicated for a product, any of those vendors meeting the requirements may be submitted.

D. Some product specifications in this Division are of the Acceptable Manufacturer type. Vendors listed as Acceptable Manufacturers are acceptable as vendors. However, the product submitted is subject to review as being fully equivalent in detail to the basis of design.

E. Where multiple vendors are listed with product model numbers, each model and vendor is acceptable, provide all requirements are met. Model numbers are indicated to the extent believe necessary to identify a type and are not necessary completely.

F. The architectural/engineering team has designed the facility using requirements of the Basis of Design equipment. Any substitutions from the basis of design, which will require additional A/E design and/or coordination, shall include the cost of necessary redesign by professionals licensed in the respective disciplines and the approval of the professional of record.

1.17 DRAWINGS AND SPECIFICATIONS

A. These specifications are accompanied by Drawings. The Drawings and Specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both.

B. The Drawings are generally diagrammatic. Lay out work at the site to conform to existing conditions; architectural, structural, mechanical, and electrical conditions; to avoid all obstructions; and to conform to details of installation as required. Provide an integrated satisfactorily operating installation. All necessary offsets in piping, fittings, duct, etc., required to avoid interferences between piping, equipment, architectural, and structural elements shall be provided by the Contractor. Provide all necessary routing and offsets to avoid conflict.

C. Verify and arrange that sufficient space is provided for the installation of proposed products and that adequate access will exist for service and maintenance of equipment. For this work, adequate access shall be defined as meaning that service personnel can access and maintain a piece of equipment without having to alter permanent construction. Further, for equipment located above ceilings, access shall be available within 3 feet pf ceiling opening or lay-in ceiling.

1.18 COMPLEMENTARY DOCUMENTS

A. Contract documents are complementary; requirements are not necessarily repetitively stated at each possible subject; consider that a requirement applies wherever applicable.

B. In the event of conflicting requirements in different parts of the Documents, the more expensive shall be presumed to apply, unless the Architect clarifies the requirement in a less expensive manner and waives the more expensive requirement in writing.

Since codes and standards are incorporated by reference, a particular conflict may appear in that a reference may use language that implies that a particular requirement in the Construction Documents is waived under the reference. This is not the case, unless specifically so clarified by the Architect. Generally, the specific Drawings and Specifications take precedence over waivers in multi-purpose reference documents.

C. Because of licensure and workmanship requirements, persons performing the work are presumed to be familiar with applicable codes, ordinances, laws, regulations and standards. Therefore, details of materials, methods, arrangements and size contained in such publications

are not necessarily replicated in the Contract Documents. This in no way deletes the requirement of the Contractor to comply. In the event of an apparent conflict between such publications and the Contract Documents, request clarification from the Architect prior to construction.

1.19 PROTECTION

A. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation. All materials and equipment shall be covered and protected against dirt, water, chemicals or mechanical injury.

1.20 CUTTING AND PATCHING

A. All subcontractors shall notify the General Contractor sufficiently ahead of construction of any floor, walls, ceiling, roof, etc., of any openings that will be required for his work. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper installation of the work under this Contract shall be done at the Subcontractor's expense in a neat and workmanlike manner.

1.21 DEMOLITION

A. It shall be the responsibility of the contractor to see that all demolition and remodeling work involving his trade is accomplished in a manner and completeness to provide the appearance of new construction work.

B. Coordinate with other divisions before commencing work.

C. All abandoned and/or otherwise unused piping shall be securely capped using materials of the same composition as the original piping.

1.22 RECORD DOCUMENTS

A. Drawings: The Contractor shall maintain and update daily a set of "blueline" prints in the Field Office for the sole purpose of recording "installed" conditions. Revise the drawings to reflect as-built conditions, including all addenda, change orders, final shop drawing reviews, and field routing. Underground utilities shall be dimensionally located relative to readily accessible and identifiable permanent reference points, with accurate slope and elevation indicated. Submit prints for review. Revise, certify accuracy, and provide two final sets to the Architect.

B. Owner's Manual: Prior to final acceptance, provide two bound volumes to the Architect. Index by subject. Include corrected submittals and shop drawings that reflect final review comments; installation, operation and maintenance instructions, parts lists, wiring diagrams, and piping diagrams; warranties.

1.23 INSPECTION, OBSERVATION, AND TESTING

A. Cooperate with Architect's representative and authorities having jurisdiction. Provide complete access to the work at reasonable times.

B. Cover-up: Prior to covering up work, or conducting observed tests, request observation as appropriate. Provide adequate advance notice defined as a minimum of five working days. In some cases the Architect's representative may waive observation; otherwise arrange for observed construction and testing prior to cover-up. Should minimize required notice not to be provided and the contractor covers up work requiring observation, such work shall be uncovered at contractor's expense.

C. Pre-Testing: Self-inspect, pre-test, and remedy work prior to performing observed test.

D. Sectional Work: In circumstances where a requirement for phased construction or other considerations dictate sectional construction and/or testing, notify the Architect when construction begins on the first section of a system, and when the first section will be ready for observed testing, as well as subsequent sections. Test in the largest practical sections.

1.24 WORK PERFORMED UNDER OTHER DIVISIONS

A. Refer to Division 2 for piped utilities beyond 5 feet from the building.

B. Refer to Division 26 for power wiring systems external to equipment and control panels; starters in motor centers; safety switches not integral to equipment or starters provided under Division 23.

1.25 TESTING SERVICES

A. Additional Testing: In addition to any specified testing, the Architect may cause additional testing to be performed by an independent testing laboratory or any other qualified party. If such testing reveals deficient work by the Contractor, the Contractor shall pay for both the testing and remedial work. If such testing does not reveal deficient work by the Contractor, the Owner shall pay for the testing and the cost of repairing any damage caused by such testing.

B. Specified Testing Services: If independent testing services are specified regarding work under this Division, cooperate fully with the testing agency. Provide access to the work. Provide test holes and taps necessary. Remove work that is not tested on site, deliver to testing agency, and reinstall if undamaged; replace if damaged. Provide utilities, operational capability, and facilities for on-site testing as necessary.

END OF SECTION 220510

SECTION 22 05 15
MATERIALS AND METHODS

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 materials and methods to complement other Division 22 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Labeling and identifying mechanical systems and equipment is specified in Division 22 Section "Plumbing Identification."
9. Nonshrink grout for equipment installations.
10. Field-fabricated metal and wood equipment supports.
11. Installation requirements common to equipment specification sections.
12. Mechanical demolition.
13. Cutting and patching.
14. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in Division 22 piping system Sections.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data Book: Submit product data for all Division 22 items in a single reinforced 3-ring binder. Organize product data by specification section number. Provide table of contents showing the following:
1. Specification Section
2. Description of item
3. Submission number (1st submission, 2nd submission, etc.)
4. Submittal status (Approved, Revise and Resubmit, etc.)

B. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

C. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

D. Coordination Drawings: For access panel and door locations.

E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Clearances for installing and maintaining insulation.
3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
4. Equipment and accessory service connections and support details.
5. Exterior wall and foundation penetrations.
6. Fire-rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

F. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

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, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

    a. Capitol Manufacturing Co.
    b. Central Plastics Co.
    c. Eclipse, Inc.; Rockford-Eclipse Div.
    d. Epco Sales Inc.
    e. Hart Industries International, Inc.
    f. Watts Industries, Inc.; Water Products Div.
    g. Zurn Industries, Inc.; Wilkins Div.

2. Dielectric Flanges:

    a. Capitol Manufacturing Co.
    b. Central Plastics Co.
    c. Epco Sales Inc.
    d. Watts Industries, Inc.; Water Products Div.

3. Dielectric-Flange Insulating Kits:

    a. Calpico, Inc.
    b. Central Plastics Co.

4. Dielectric Couplings:

    a. Calpico, Inc.
    b. Lochinvar Corp.

5. Dielectric Nipples:

    a. Grinnell Corp.; Grinnell Supply Sales Co.
    b. Perfection Corp.
    c. Victaulic Co. of America.

6. Metal, Flexible Connectors:

    a. ANAMET Industrial, Inc.
    b. Central Sprink, Inc.
    c. Flexicraft Industries.
    d. Flex-Weld, Inc.
    e. Grinnell Corp.; Grinnell Supply Sales Co.
    f. Hyspan Precision Products, Inc.
    g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
    h. Mercer Rubber Co.
    i. Metraflex Co.
    j. Proco Products, Inc.
    k. Uniflex, Inc.

7. Rubber, Flexible Connectors:

    a. General Rubber Corp.
    b. Mercer Rubber Co.
    c. Metraflex Co.
    d. Proco Products, Inc.
    e. Red Valve Co., Inc.
    f. Uniflex, Inc.

8. Mechanical Sleeve Seals:

    a. Calpico, Inc.
    b. Metraflex Co.
    c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 22 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.

G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:

1. 2-Inch NPS and Smaller: Threaded.
2. 2-1/2-Inch NPS and Larger: Flanged.
3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.

B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.

C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

5. PVC: Manufactured, permanent, with nailing flange for attaching to wooden forms.
6. PVC Pipe: ASTM D 1785, Schedule 40.
7. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: One piece, with set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

4. Cast Brass: Split casting, with concealed hinge and set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

5. Stamped Steel: One piece, with set screw and chrome-plated finish.
6. Stamped Steel: One piece, with spring clips and chrome-plated finish.
7. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
9. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
11. Cast-Iron Floor Plate: One-piece casting.

2.8 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 22 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: Accessible and visible location.

C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inch- high letters for ductwork and not less than 3/4-inch- high letters for access door signs and similar operational instructions.

1. Material: Fiberboard.
2. Material: Brass.
3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.
4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.

F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.

1. Fabricate in sizes required for message.
2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
3. Punch for mechanical fastening.
4. Thickness: 1/16 inch, unless otherwise indicated.
5. Thickness: 1/8 inch, unless otherwise indicated.
6. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

G. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.9 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: 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.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.

4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Permanent sleeves are not required for holes formed by PE removable sleeves.

P. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

Q. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. PVC Pipe Sleeves: For pipes smaller than 6-inch NPS.
    b. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
    c. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
    d. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

        1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Section "Joint Sealants" for materials.
5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

R. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

T. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Section "Firestopping" for materials.

U. Verify final equipment locations for roughing-in.

V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
5. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
6. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
7. 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:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. 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.

8. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
9. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.

10. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. ABS Piping: ASTM D 2235 and ASTM D 2661.
    c. CPVC Piping: ASTM D 2846 and ASTM F 493.
    d. PVC Pressure Piping: ASTM D 2672.
    e. PVC Nonpressure Piping: ASTM D 2855.
    f. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

11. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.
    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

X. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
3. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
    c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
    d. At access doors, manholes, and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.
    f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
    g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

3.4 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.

B. Apply paint to exposed piping according to the following, unless otherwise indicated:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Do not paint piping specialties with factory-applied finish.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

A. Disconnect, demolish, and remove Work specified in Division 22 Sections.

B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from Project site.

F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.9 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 220515

SECTION 22 05 29
HANGERS AND SUPPORTS

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 hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Fire-Suppression Piping" for pipe hangers for fire-protection piping.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Fiberglass strut systems. Include Product Data for components.
4. Pipe stands. Include Product Data for components.
5. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1**,** **"**Structural Welding Code—Steel**”**

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. 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.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers: Similar to MSS Type 1, steel pipe hanger except hanger is made of fiberglass and continuous-thread rod and nuts are made of polyurethane or stainless steel.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Champion Fiberglass, Inc.
c. Cope, T. J., Inc.; Tyco International, Ltd.
d. Seasafe, Inc.
e. Unistrut Corp.; Tyco International, Ltd.
f. Wesanco, Inc.

B. Strap-Type, Fiberglass Pipe Hangers: Made of fiberglass loop with stainless-steel continuous-thread rod, nuts, and support hook.

1. Available Manufacturers:

a. Plasti-Fab, Inc.

2.5 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.6 FIBERGLASS STRUT SYSTEMS

A. Description: Shop- or field-fabricated pipe-support assembly, similar to MFMA-3, made of fiberglass channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Champion Fiberglass, Inc.
3. Cope, T. J., Inc.; Tyco International Ltd.
4. Seasafe, Inc.

2.7 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.8 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.

1. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.9 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Available Manufacturers:

a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.
c. Portable Pipe Hangers.

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Available Manufacturers:

a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.10 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.11 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, 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 (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified 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 padded hangers for piping that is subject to scratching.

F. 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 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.

15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. 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 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. 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 (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. 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. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. 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 (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. 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.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include

auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

a. Horizontal (MSS Type 54): Mounted horizontally.
b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel 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 building structure.

B. 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 above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 7 Section "Roof Accessories" for curbs.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. 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.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. 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 (DN 65)**] 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.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

P. Insulated Piping: Comply with the following:

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 according to ASME B31.1 for power piping and 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 (DN 100) 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 (DN 100) 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 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 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 smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 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 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 contours of welded surfaces match adjacent contours.

3.5 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.

3.6 PAINTING

A. Touch Up: 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 minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 22 05 53
PLUMBING IDENTIFICATION

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. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Stencils.
4. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) 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 (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), 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.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 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 partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. 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 (38 mm) high.

2.3 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches (32 mm) for ducts; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.4 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

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 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 (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

END OF SECTION 220553

SECTION 22 07 13
PLUMBING 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 mechanical insulation for duct, equipment, and pipe, including the following:

1. Insulation Materials:

    a. Phenolic Foam.
    b. Cellular glass.
    c. Flexible elastomeric.
    d. Mineral fiber.

2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Lagging adhesives.
7. Sealants.
8. Factory-applied jackets.
9. Field-applied fabric-reinforcing mesh.
10. Field-applied cloths.
11. Field-applied jackets.
12. Tapes.
13. Securements.
14. Corner angles.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. PVDC: Polyvinylidene chloride.

E. SSL: Self-sealing lap.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Insulation application at pipe expansion joints for each type of insulation.
3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Removable insulation at piping specialties, equipment connections, and access panels.
5. Application of field-applied jackets.
6. Application at linkages of control devices.
7. Field application for each equipment type.

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control inspection reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 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.

2.2 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about 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. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

    a. ACS.
    b. Pittsburgh Corning Corporation; Foamglas Super K.
2. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
3. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Available Products:

    a. Aeroflex USA Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. 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 Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Owens Corning; All-Service Duct Wrap.

I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

    a. CertainTeed Corp.; Commercial Board.
    b. Johns Manville; 800 Series Spin-Glas.
    c. Knauf Insulation; Insulation Board.
    d. Owens Corning; Fiberglas 700 Series.

J. Mineral-Fiber, Preformed Pipe Insulation:

1. Available Products:
    a. Johns Manville; Micro-Lok.

b. Knauf Insulation; 1000(Pipe Insulation.
c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) 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 Part 2 "Factory-Applied Jackets" Article.

2.3 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is UL tested and certified to provide a 1 or 2-hour fire rating, as required.

1. Products:

a. CertainTeed Corp.; FlameChek.
b. Johns Manville; Firetemp Wrap.
c. Thermal Ceramics; FireMaster Duct Wrap.
d. 3M; Fire Barrier Wrap Products.

2.4 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.5 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. Cellular-Glass Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

2.6 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products:

a. Childers Products, Division of ITW; CP-30.
b. Foster Products Corporation, H. B. Fuller Company; 30-35.
c. ITW TACC, Division of Illinois Tool Works; CB-25.
d. Marathon Industries, Inc.; 501.
e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

2.7 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
2. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
3. Color: White.

2.8 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Products:

a. Childers Products, Division of ITW; CP-76.
b. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).

4. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: White.

2.9 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.

2.10 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. inch (4 strands by 4 strands/sq. mm) for covering pipe and pipe fittings.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. (203 g/sq. m) with a thread count of 5 strands by 5 strands/sq. inch (2 strands by 2 strands/sq. mm) for covering equipment.

2.11 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

2.12 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. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness 20 mil; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

4. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Thickness: 0.020" Smooth.
    c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.13 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. 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 and UL listed.

1. Width: 3 inches.
2. Thickness: 6.5 mils.

3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.14 SECUREMENTS

A. Bands:
1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.
2. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. 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.

D. Wire: 0.080-inch nickel-copper alloy.

2.15 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. 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 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and 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 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. Manholes.
5. Handholes.
6. Cleanouts.

3.4 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 Below-Grade 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. 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. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. 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. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section "Through-Penetration Firestop Systems."

3.5 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, 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, vessels, and equipment. 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.

3.6 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of 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 services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but 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 cut sections of cellular-glass block insulation of same thickness as pipe 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. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. 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.

3.7 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

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.

3.8 MINERAL-FIBER INSULATION INSTALLATION

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 but 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.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. 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.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. 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.

3.10 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 7 Section "Through-Penetration Firestop Systems."

3.11 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections. Paint only those items in exposed, public areas.

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.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent inspecting agency to perform field inspections and prepare inspection reports.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements. Remove defective Work.

C. Install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures after new materials are installed.

3.13 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Domestic hot-water storage tank insulation shall be the following:

1. Mineral-Fiber Board: 4 inches thick and 2-lb/cu. ft. nominal density.

3.14 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. Fire-suppression piping.
2. Drainage piping located in crawl spaces.
3. Below-grade piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.15 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1/2 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

C. Domestic Chilled Water (Potable):

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

D. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.
2. Insulation required on horizontal and vertical runs.

E. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

F. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Flexible Elastomeric: 3/4 inch thick.

G. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

3.16 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber Pipe Insulation, Type I: 1 inches thick.

3.17 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. ASJ – factory.

D. Piping, Exposed:
1. PVC: 20 mils thick.

3.18 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. Equipment, Concealed:

1. PVC: 20 mils thick.

D. Equipment, Exposed:

1. Aluminum, Smooth: 0.020 inch thick.

E. Piping, Concealed:
1. PVC: 20 mils thick.

F. Piping, Exposed:
1. Aluminum, Smooth: 0.020 inch thick.

3.19 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220713

SECTION 22 13 16
SANITARY WASTE AND VENT PIPING

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 for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

B. Related Sections include the following:

1. Division 22 Section "Chemical-Waste Piping" for chemical-waste and vent piping systems.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. PE: Polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. Shop Drawings:
1. Sovent Drainage System: Include plans, elevations, sections, and details.

C. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

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.

C. Lead and Oakum: ASTM B 29, pure lead and oakum or hemp fiber.

2.3 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

C. Rigid, Unshielded Couplings: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.4 PVC PIPE AND FITTINGS

A. Solid-Wall schedule 40 PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

2.5 SPECIAL PIPE FITTINGS

A. Sovent Drainage System Fittings: ASME B16.45 or ASSE 1043, cast-iron aerator and deaerator fittings.

B. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Expansion Joints: Two or three-piece, ductile-iron assembly consisting of telescoping sleeve(s) with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

E. Wall-Penetration Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

F. Tubular Fittings: ASTM F 409, PVC drainage-pattern tube and tubular fittings with ends as required for application.

2.6 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, high-density, crosslaminated PE film of 0.004-inch (0.10-mm) minimum thickness.

B. Form: tube.

C. Color: Black.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Piping installed in building plenums shall meet requirements of materials within ducts or plenums (ceiling spaces used as supply or return air plenums) and shall have a flame-spread index of not more than 25 and a smoke-developed rating of not more than 50 when tested in accordance with the test for Surface Burning Characteristics of Materials.

C. Aboveground, soil and waste piping NPS 4 (DN 100) and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

D. Aboveground, soil and waste piping NPS 5 (DN 125) and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

E. Aboveground, vent piping all sizes shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

F. Underground, soil, waste, and vent piping all sizes shall be any of the following:
1. Solid wall schedule 40 PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.3 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Section "Sanitary Sewerage."

B. Basic piping installation requirements are specified in Division 22 Section "Materials and Methods."

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to

make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Basic Mechanical Materials and Methods."

E. 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.

F. 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 2 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.

G. 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.

H. 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 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) 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.

I. Install engineered soil and waste drainage and vent piping systems as follows:

1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

L. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."

B. 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.

C. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

D. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

E. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

F. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "Valves."

B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.

1. Horizontal Piping: Horizontal backwater valves.
2. Floor Drains: Drain outlet backwater valves, unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Backwater valve are specified in Division 22 Section "Plumbing Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. 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 (DN 40 and DN 50): 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 60 inches (1500 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 60 inches (1500 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 60 inches (1500 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 60 inches (1500 mm) with 7/8-inch (22-mm) rod.

F. Install supports for vertical cast-iron soil piping every 15 feet (4.5 m).

G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches (1200 mm) with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches (1200 mm) with 1/2-inch (13-mm) rod.
3. NPS 4 and 5 (DN 100 and 125): 48 inches (1200 mm) with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches (1200 mm) with 3/4-inch (19-mm) rod.
5. NPS 8 to NPS 12 (DN 200 to DN 300): 48 inches (1200 mm) with 7/8-inch (22-mm) rod.

H. Install supports for vertical PVC piping every 48 inches (1200 mm).

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 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. 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 (DN 65) and larger.

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 (30 kPa). 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 (250 Pa). 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

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 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 221316

SECTION 22 42 50
PLUMBING SPECIALTIES

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 plumbing specialties:

1. Backflow preventers.
2. Dishwasher air-gap fittings.
3. Water regulators.
4. Balancing valves.
5. Thermostatic water mixing valves.
6. Water tempering valves.
7. Strainers.
8. Outlet boxes.
9. Washer-supply outlets.
10. Hose stations.
11. Key-operation hydrants.
12. Wheel-handle wall hydrants.
13. Nondraining nonfreeze post hydrants.
14. Trap seal primer valves.
15. Drain valves.
16. Backwater valves.
17. Miscellaneous piping specialties.
18. Sleeve penetration systems.
19. Flashing materials.
20. Cleanouts.
21. Floor drains.
22. Trench drains.
23. Roof drains.
24. Grease interceptors.
25. Oil interceptors.
26. Solids interceptors.

1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PE: Polyethylene plastic.
3. PUR: Polyurethane plastic.

4. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig (860 kPa).
2. Sanitary Waste and Vent Piping: 10-foot head of water (30 kPa).
3. Storm Drainage Piping: 10-foot head of water (30 kPa).

1.5 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Backflow preventers and water regulators.
2. Balancing valves and strainers.
3. Thermostatic water mixing valves and water tempering valves.
4. Water hammer arresters, air vents, and trap seal primer valves and systems.
5. Drain valves, hose bibbs, hydrants, and hose stations.
6. Outlet boxes and washer-supply outlets.
7. Backwater valves, cleanouts, floor drains, open receptors, trench drains, and roof drains.
8. Air-admittance valves, vent caps, vent terminals, and roof flashing assemblies.
9. Grease interceptors, oil interceptors, and solids interceptors.
10. Sleeve penetration systems.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field test reports.

D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:

1. Backflow preventers and water regulators.
2. Thermostatic water mixing valves and water tempering valves.
3. Trap seal primer valves and systems.
4. Hose stations and hydrants.
5. Grease interceptors, oil interceptors, and solids interceptors.

1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. 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.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

E. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

1.7 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.
1. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

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. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 BACKFLOW PREVENTERS

A. Available Manufacturers:

B. Manufacturers:
1. B & K Industries, Inc.
2. Cla-Val Co.
3. Conbraco Industries, Inc.
4. Mueller Co.; Hersey Meters Div.
5. Park Equipment.
6. Watts Industries, Inc.; Water Products Div.
7. Zurn Industries, Inc.; Wilkins Div.

C. General: ASSE standard, backflow preventers.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.
2. NPS 2-1/2 (DN 65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.

    a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.

3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.
5. Strainer: On inlet, if indicated.

D. Pipe-Applied, Atmospheric-Type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

E. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

F. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, suitable for continuous pressure application. Include inlet screen and two independent check valves with intermediate atmospheric vent.

G. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

H. Double-Check Backflow Prevention Assemblies: ASSE 1015, suitable for continuous pressure application. Include shutoff valves on inlet and outlet, and strainer on inlet; test cocks; and two positive-seating check valves.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

I. Antisiphon-Pressure-Type Vacuum Breakers: ASSE 1020, suitable for continuous pressure application. Include shutoff valves, spring-loaded check valve, spring-loaded floating disc, test cocks, and atmospheric vent.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

J. Dual-Check-Valve-Type Backflow Preventers: ASSE 1024, suitable for continuous pressure application. Include union inlet and two independent check valves.

K. Dual-Check-Valve-Type Backflow Preventers: ASSE 1032, suitable for continuous pressure application for carbonated beverage dispensers. Include stainless-steel body; primary and secondary checks; ball check; intermediate atmospheric-vent port for relieving carbon dioxide; and threaded ends, NPS 3/8 (DN 10).

L. Laboratory Faucet Vacuum Breakers: ASSE 1035, suitable for continuous pressure application and chrome plated; consisting of primary and secondary checks; intermediate vacuum breaker; and threaded ends, NPS 1/4 or NPS 3/8 (DN 8 or DN 10) as required.

M. Reduced-Pressure Detector Assembly Backflow Preventers: ASSE 1047, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves; and bypass with displacement-type water meter, valves, and reduced-pressure backflow preventer.

1. Pressure Loss: 12 psig (83 kPa) maximum, through middle 1/3 of flow range.

N. Double-Check Detector Assembly Backflow Preventers: ASSE 1048, FM approved or UL listed, and suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet. Include test cocks; two positive-seating check valves; and bypass with displacement-type water meter, valves, and double-check backflow preventer.

1. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.

O. Hose-Connection Backflow Preventers: ASSE 1052, suitable for at least 3-gpm (0.19-L/s) flow and applications with up to 10-foot head of water (30-kPa) back pressure. Include two check valves; intermediate atmospheric vent; and nonremovable, ASME B1.20.7, garden-hose threads on outlet.

P. Back-Siphonage Backflow Vacuum Breakers: ASSE 1056, suitable for continuous pressure and backflow applications. Include shutoff valves, check valve, test cocks, and vacuum vent.

2.3 DISHWASHER AIR-GAP FITTINGS

A. Description: ASSE 1021, fitting suitable for use with domestic dishwashers and for deck mounting; with plastic body, chrome-plated brass cover; and capacity of at least 5 gpm (0.32 L/s); and inlet pressure of at least 5 psig (35 kPa) at temperature of at least 140 deg F (60 deg C). Include 5/8-inch- (16-mm-) ID inlet and 7/8-inch- (22-mm-) ID outlet hose connections.

B. Hoses: Rubber and suitable for temperature of at least 140 deg F (60 deg C).

1. Inlet Hose: 5/8-inch- (16-mm-) ID and 48 inches long.
2. Outlet Hose: 7/8-inch- (22-mm-) ID and 48 inches long.

2.4 WATER REGULATORS

A. Available Manufacturers:
1. Cla-Val Co.
2. Conbraco Industries, Inc.
3. Watts Industries, Inc.; Water Products Div.
4. Zurn Industries, Inc.; Wilkins Div.

B. General: ASSE 1003, water regulators, rated for initial working pressure of 150 psig (1035 kPa) minimum. Include integral factory-installed or separate field-installed, Y-pattern strainer.

1. NPS 2 (DN 50) and Smaller: Bronze body with threaded ends.

a. General-Duty Service: Single-seated, direct operated, unless otherwise indicated.
b. Booster Heater Water Supply: Single-seated, direct operated with integral bypass.

2. NPS 2-1/2 (DN 65) and Larger: Bronze or cast-iron body with flanged ends. Include AWWA C550 or FDA-approved, interior epoxy coating for regulators with cast-iron body.

a. Type: Single-seated, direct operated.
b. Type: Pilot-operated, single- or double-seated, cast-iron-body main valve, with bronze-body pilot valve.

3. Interior Components: Corrosion-resistant materials.
4. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.

2.5 BALANCING VALVES

A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.

1. Available Manufacturers:

a. Amtrol, Inc.
b. Flow Design, Inc.
c. ITT Industries; Bell & Gossett Div.
d. Watts Industries, Inc.; Water Products Div.

2. NPS 2 (DN 50) and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
3. NPS 2 (DN 50) and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.
4. NPS 2-1/2 (DN 65) and Larger: Cast-iron, Y-pattern body with bronze disc and flanged or grooved ends.

B. Memory-Stop Balancing Valves, NPS 2 (DN 50) and Smaller: MSS SP-110, ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard or full-port, chrome-plated brass ball, replaceable seats and seals, threaded or solder-joint ends, and vinyl-covered steel handle with memory-stop device.

1. Available Manufacturers:

a. Conbraco Industries, Inc.
b. Crane Co.
c. Grinnell Corporation.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Red-White Valve Corp.

2.6 THERMOSTATIC WATER MIXING VALVES

A. Manufacturers:
1. Bradley.
2. Lawler Manufacturing Company, Inc.
3. Leonard Valve Company.
4. Powers.
5. Symmons Industries, Inc.
6. T & S Brass and Bronze Works, Inc.

B. General: ASSE 1017, manually adjustable, thermostatic water mixing valve with bronze body. Include check stop and union on hot- and cold-water-supply inlets, adjustable temperature setting, and thermometer. Refer to plumbing schedules for further information.

2.7 WATER TEMPERING VALVES

A. Available Manufacturers:

B. Manufacturers:

1. Heat-Timer Corporation.
2. Holby Valve Co., Inc.
3. Sparco, Inc.
4. Watts Industries, Inc.; Water Products Div.

C. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting.

D. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald protection. Include threaded inlets and outlet.

1. Finish: [**Rough bronze**] [**Chrome plated**].

E. Limited-Volume, Water Tempering Valves: Solder-joint inlets and NPS 3/4 (DN 20) maximum outlet.

2.8 STRAINERS

A. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch (1.2-mm) round perforations, unless otherwise indicated.

1. Pressure Rating: 125-psig (860-kPa) minimum steam working pressure, unless otherwise indicated.
2. NPS 2 (DN 50) and Smaller: Bronze body, with female threaded ends.
3. NPS 2-1/2 (DN 65) and Larger: Cast-iron body, with interior AWWA C550 or FDA-approved, epoxy coating and flanged ends.
4. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.

a. Drain: Factory- or field-installed, hose-end drain valve.

2.9 OUTLET BOXES

A. Available Manufacturers:

1. Acorn Engineering Company.
2. Gray, Guy Manufacturing Co., Inc.
3. Oatey.
4. Symmons Industries, Inc.
5. Zurn Industries, Inc.; Jonespec Div.

B. General: Recessed-mounting outlet boxes with supply fittings complying with ASME A112.18.1M. Include box with faceplate, services indicated for equipment connections, and wood-blocking reinforcement.

C. Clothes Washer Outlet Boxes: With hot- and cold-water hose connections and drain. Refer to plumbing schedules for further information.

D. Icemaker Outlet Boxes: With hose connection. Refer to plumbing schedules for further information.

E. Reinforcement: 2-by-4-inch (38-by-89-mm) fire-retardant-treated-wood blocking between studs. Fire-retardant-treated-wood blocking is specified in Section "Rough Carpentry."

2.10 HOSE STATIONS

A. Available Manufacturers:
1. Leonard Valve Company.
2. Strahman Valves, Inc.
3. T & S Brass and Bronze Works, Inc.

B. General: Assembly with fitting complying with ASME A112.18.1M and hose-connection outlet with threads complying with ASME B1.20.7. Refer to plumbing schedules for further information.

2.11 KEY-OPERATION HYDRANTS

A. Available Manufacturers:

1. Josam Co.
2. Simmons Manufacturing Co.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Industries, Inc.
6. Woodford Manufacturing Co.
7. Zurn Industries.

B. General: ASME A112.21.3M, key-operation hydrant with pressure rating of 125 psig (860 kPa). Refer to plumbing schedule for further information.

2.12 WHEEL-HANDLE WALL HYDRANTS

A. Available Manufacturers:
1. B & K Industries, Inc.
2. NIBCO INC.
3. Sioux Chief Manufacturing Co., Inc.
4. Watts Industries, Inc.; Water Products Div.
5. Woodford Manufacturing Co.
6. Zurn Industries, Inc.; Jonespec Div.

B. Refer to plumbing schedule for further information.

2.13 NONDRAINING NONFREEZE POST HYDRANTS

A. General: All-metal lever operation with nondraining water-storage reservoir, designed without drain and to be freezeproof with components of at least length required for burial of valve and water storage reservoir below frost line. Refer to plumbing schedule for further information.

2.14 TRAP SEAL PRIMER VALVES

A. Supply-Type Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:

1. Available Manufacturers:
   a. Josam Co.
   b. MIFAB Manufacturing, Inc.
   c. Precision Plumbing Products, Inc.
   d. Smith.
   e. Wade.
   f. Watts Industries, Inc.
   g. Zurn Industries.

2. 125-psig (860-kPa) minimum working pressure.
3. Bronze body with atmospheric-vented drain chamber.
4. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type Trap Seal Primer Valves: ASSE 1044, fixture-trap, waste-drainage-fed type, with the following characteristics:

1. Chrome-plated, cast-brass, NPS 1-1/4 (DN 32) minimum, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.

C. Trap Seal Primer System: Factory-fabricated, automatic-operation assembly for wall mounting with the following:

1. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing inlet and manifold with number of NPS 1/2 (DN 15) outlets as indicated.

2. Cabinet: Steel box with stainless-steel cover.
3. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
4. Water Hammer Arrester: ASSE 1010.
5. Vacuum Breaker: ASSE 1001.

2.15 DRAIN VALVES

A. Hose-End Drain Valves: MSS SP-110, NPS 3/4 (DN 20) ball valve, rated for 400-psig (2760-kPa) minimum CWP. Include two-piece, copper-alloy body with standard port, chrome-plated brass ball, replaceable seats and seals, blowout-proof stem, and vinyl-covered steel handle.

1. Inlet: Threaded or solder joint.
2. Outlet: Short-threaded nipple with ASME B1.20.7, garden-hose threads and cap.

B. Hose-End Drain Valve: MSS SP-80, gate valve, Class 125, ASTM B 62 bronze body, with NPS 3/4 (DN 20) threaded or solder-joint inlet and ASME B1.20.7, garden-hose threads on outlet and cap. Hose bibbs are prohibited for this application.

C. Stop-and-Waste Drain Valves: MSS SP-110, ball valve, rated for 200-psig (1380-kPa) minimum CWP or MSS SP-80, Class 125, gate valve; ASTM B 62 bronze body, with NPS 1/8 (DN 6) side drain outlet and cap.

2.16 BACKWATER VALVES

A. Available Manufacturers:

1. Josam Co.
2. Smith, Jay R. Mfg. Co.
3. Watts Industries, Inc.; Drainage Products Div.
4. Zurn Industries, Inc.; Specification Drainage Operation.

B. Horizontal Backwater Valves: ASME A112.14.1, cast-iron body, with removable bronze swing-check valve and threaded or bolted cover.

1. Closed-Position Check Valve: Factory assembled or field modified to hang closed unless subject to backflow condition.
2. Open-Position Check Valve: Factory assembled or field modified to hang open for airflow.
3. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor, instead of cover.

C. Drain Outlet Backwater Valves: Cast-iron or bronze body, with removable ball float, threaded inlet, and threaded or spigot outlet for installation in bottom outlet of floor drain.

2.17 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.

1. Available Manufacturers:

    a. Josam Co.
    b. Smith, Jay R. Mfg. Co.
    c. Tyler Pipe; Wade Div.
    d. Zurn Industries, Inc.; Specification Drainage Operation.

B. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

1. Available Manufacturers:
    a. Josam Co.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Watts Industries, Inc.
    e. Zurn Industries, Inc.

C. Hose Bibbs: Bronze body with replaceable seat disc complying with ASME A112.18.1M for compression-type faucets. Include NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet, of design suitable for pressure of at least 125 psig (860 kPa); integral nonremovable, drainable hose-connection vacuum breaker; and garden-hose threads complying with ASME B1.20.7 on outlet.

1. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
2. Finish for Service Areas: Rough bronze.
3. Finish for Finished Rooms: Chrome or nickel plated.
4. Operation for Equipment Rooms: Wheel handle or operating key.
5. Operation for Service Areas: Operating key.
6. Operation for Finished Rooms: Operating key.
7. Include operating key with each operating-key hose bibb.
8. Include wall flange with each chrome- or nickel-plated hose bibb.

D. Air Vents: Float type for automatic air venting.

1. Bolted Construction: Bronze body with replaceable, corrosion-resistant metal float and stainless-steel mechanism and seat; threaded NPS 3/8 (DN 10) minimum inlet; 125-psig (860-kPa) minimum pressure rating at 140 deg F (60 deg C); and threaded vent outlet.
2. Welded Construction: Stainless-steel body with corrosion-resistant metal float, stainless-steel mechanism and seat, threaded NPS 3/8 (DN 10) minimum inlet, 150-psig (1035-kPa) minimum pressure rating, and threaded vent outlet.

E. Air-Admittance Valves: Plastic housing with mechanical-operation sealing diaphragm, designed to admit air into drainage and vent piping and to prevent transmission of sewer gas into building.

1. Available Manufacturers:

    a. B & K Industries, Inc.
    b. IPS Corporation.
    c. J & B Products.
    d. Oatey.
    e. Sioux Chief Manufacturing Co., Inc.

2. Stack Vent Valve: ASSE 1050, designed for installation as terminal on soil, waste, and vent stacks, instead of stack vent extending through roof, in NPS 2 to NPS 4 (DN 50 to DN 100).
3. Fixture Vent Valve: ASSE 1051, designed for installation on waste piping, instead of vent connection, for single fixture, in NPS 1-1/4 to NPS 2 (DN 32 to DN 50).

F. Roof Flashing Assemblies: Manufactured assembly made of 4-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe with galvanized steel boot reinforcement, and counterflashing fitting.

1. Available Manufacturers:
2. Manufacturers:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.

3. Open-Top Vent Cap: Without cap.
4. Low-Silhouette Vent Cap: With vandal-proof vent cap.
5. Extended Vent Cap: With field-installed, vandal-proof vent cap.

G. Open Drains: 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.

H. Deep-Seal Traps: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap seal primer valve connection.

1. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
2. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

I. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

J. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

K. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

L. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

M. Vent Terminals: Commercially manufactured, shop- or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch (25-mm) enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing.

N. Expansion Joints: ASME A112.21.2M, assembly with cast-iron body with bronze sleeve, packing gland, and packing; of size and end types corresponding to connected piping.

O. Downspout Boots: ASTM A 48 (ASTM A 48M), gray-iron casting, with NPS 4 (DN 100) outlet; shop-applied bituminous coating; and inlet size to match downspout.

P. Downspout Boots: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.

Q. Conductor Nozzles: Bronze body with threaded inlet for connected conductor size, and bronze wall flange with mounting holes.

1. Finish: Nickel bronze.

2.18 SLEEVE PENETRATION SYSTEMS

A. Available Manufacturers:

1. ProSet Systems, Inc.

B. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.

1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
2. Stack Fitting: ASTM A 48 (ASTM A 48M), gray-iron, hubless-pattern, wye-branch stack fitting with neoprene O-ring at base and gray-iron plug in thermal-release harness in branch. Include PVC protective cap for plug.

a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.

2.19 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Copper Sheet: ASTM B 152 (ASTM B 152M), of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft. (3.7 kg/sq. m or 0.41-mm thickness).
2. Vent Pipe Flashing: 8 oz./sq. ft. (2.5 kg/sq. m or 0.27-mm thickness).

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.20 CLEANOUTS

A. Cleanouts,: Comply with ASME A112.3.1.

1. Application: Floor cleanout and wall cleanout.
2. Manufacturer:
    a. Josam Co.
    b. Smith.
    c. Wade.
    d. Zurn.
3. Refer to Plumbing Schedule for Specification Standards.

2.21 FLOOR DRAINS

A. Floor Drains,: Comply with ASME A112.3.1.

1. Application: Floor drain.
2. Manufacturer:
    a. Josam Co.
    b. MiFab.
    c. Smith.
    d. Wade Div.
    e. Zurn Industries.
3. Refer to Plumbing Schedule for Specification Standards.

2.22 TRENCH DRAINS

A. Trench Drains: Comply with ASME A112.3.1.
1. Manufacturer:
    a. Josam Co.
    b. Smith.
    c. Wade Div.
    d. Zurn Industries.
2. Refer to Plumbing Schedule for Specification Standards.

2.23 ROOF DRAINS

A. Roof Drains,: Comply with ASME A112.3.1.

1. Application: Roof drain.
2. Manufacturer:

   a. Josam Co.
   b. Smith.
   c. Wade Div.
   d. Zurn Industries.
3. Refer to Plumbing Schedule for Specification Standards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. 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 not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install pressure regulators with inlet and outlet shutoff valves and balance valve bypass. Install pressure gages on inlet and outlet.

D. Install strainers on supply side of each control valve, pressure regulator, and solenoid valve.

E. Install draining-type ground and ground post hydrants with 1 cu. yd. of crushed gravel around drain hole.

1. Set ground hydrants with box flush with grade.
2. Set post hydrants in concrete paving or in 1 cu. ft. of concrete block at grade.

F. Install 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.

G. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

H. Install expansion joints on vertical risers, stacks, and conductors if indicated.

I. 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 (DN 100). Use NPS 4 (DN 100) 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 (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

J. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

K. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

L. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

M. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

N. 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 (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) 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.

O. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install roof-drain flashing collar or flange so no leakage occurs between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

P. Install interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.

2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.
5. Coordinate oil-interceptor storage tank and gravity drain with Section "Fuel-Oil Distribution."

Q. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

R. Fasten recessed-type plumbing specialties to reinforcement built into walls.

S. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

T. Install individual shutoff valve in each water supply to plumbing specialties. Use ball, gate, or globe valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Division 22 Section "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

U. Install air vents at piping high points. Include ball, gate, or globe valve in inlet.

V. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

W. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

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.

C. Connect plumbing specialties to piping specified in other Division 22 Sections.

D. Ground equipment.

E. 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.

F. Connect plumbing specialties and devices that require power according to Division 26 Sections.

G. Interceptor Connections: Connect piping, flow-control fittings, and accessories.

1. Grease Interceptors: Connect inlet and outlet to unit, and flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

2. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.
3. Solids Interceptors: Connect inlet and outlet.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) 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 pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) 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. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer thermostatic water mixing valve water tempering valve grease interceptor and oil interceptor.

1. Text: 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.
2. Refer to Division 22 Section "Basic Mechanical Materials and Methods Mechanical Identification" for nameplates and signs.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain equipment. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION 224250

Section 23 05 10
MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL

A. Drawings and general provisions of contract, including General and Supplementary Conditions, and Division 1 Specification Section apply to this and other sections of Division 23.

B. Before submitting his proposal, each bidder shall examine all plans and specifications relating to the work, visit the site(s) of the proposed project, and become fully informed of the extent and character of the work required.

1.2 REFERENCE STANDARDS

A. Perform all Division 23 work in strict accordance with the Laws and Regulations of the State of Texas, and County and City codes/ordinances having jurisdiction over the project.

1.3 COORDINATION

A. Coordinate work under this Division to avoid conflicts and to attain satisfactory and complementary systems.

B. Coordinate work under this Division with work under other Divisions to avoid conflicts and to allow for adequate installation, maintenance, and operating space. Obtain the Architect's approval for penetrations of other parts of the Work prior to affecting them.

C. Prepare coordination drawings in accordance with Division 1 to a scale of ¼"=1'-0" or larger; detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow if the work.

1.4 DEFINITIONS

Specific meanings used in Division 23 (variant forms are inferred):

A. Work: This project, or the reference part.

B. Provide:

1. Furnish and install, complete with necessary appurtenances.
2. "Provide" is implied throughout this Division unless language is specific.

C. Required: Required by the contract Documents.

D. Necessary: Necessary in order to obtain a finished system in satisfactory operating condition, and meeting all requirements.

E. Furnish: Procure and deliver, ready for installation, necessary and/or required.

F. Install: Receive, place securely, ready for connection to work specified elsewhere, and bring into satisfactory operating condition, as necessary and/or required.

G. Connect: Connect properly to mechanical work. This includes non-physical “connections” such as indirect waste drains.

H. Architect, Project Architect or Architect/Engineer Team.

1.5 SCOPE OF WORK

A. The work under this Division includes providing complete mechanical systems for the project.

B. All items of labor, material or equipment not required in detail by the specifications or plans, but incidental to, or necessary for the complete installation and proper operation of all phases of work described herein, or reasonably implied in connection therewith, shall be furnished as if called for in detail by the Contract Documents.

1.6 WORKMANSHIP

A. All labor shall be performed in a workmanlike manner by mechanics skilled in their particular trades. All installations shall be complete in both effectiveness and appearance whether finally enclosed or left exposed. The architect reserves the right to direct the removal or replacement of any item which in his opinion shall not present a reasonable neat or workmanlike appearance, providing that same can be properly installed in an orderly way.

1.7 MANUFACTURER’S INSTRUCTIONS

A. All equipment and devices shall be installed in accordance with the plans and specifications, manufacturer’s instructions and applicable codes. Contractor shall obtain written recommendations of installation and start-up instructions from material vendors and comply, unless otherwise required. Bring discrepancies between these instructions and project requirements to the attention of the Architect, and resolve prior to construction. Provide signed inspection report by manufacturer’s representative at system start-up to verify all is in compliant for product warranty.

1.8 WARRANTY

A. The contractor shall warranty his work against defective materials and workmanship for a period of 1-year from date of acceptance of the job.

1.9 TRAINING

A. Upon completion of the work and at a time designated by the Owner’s representative, provide a formal training session for the Owner’s operating personnel to include location, operation, and maintenance of all mechanical equipment and systems.

1.10 PERMITS AND FEES

A. Permits: Obtain special permits necessary for this portion of the Work.

B. Fees: Pay any fees associated with permits, required inspections, and permanent utility connections to this part of the work.

1.11 LICENSES

A. Work under this Division shall be performed by organizations and individuals holding a current license to perform such type of work by the authority having jurisdiction. “License” in this sense means any process, regardless of its appellation, which is normally mandated by the authority in order to perform such type of work within its jurisdiction. The stipulation of this paragraph applies even if the work is located physically on property owned or controlled by a higher authority. E.G., to work within the city limits of Corpus Christi, Texas, on a Federal project, State of Texas and City of Corpus Christi licenses which would be mandated to work on a private project shall be required even though the City and State may have no jurisdiction over the higher government.

B. In the event that the licensed organization loses its license or is unable to obtain one, or the licensed individual performing the work becomes unlicensed or deports the organization, notify Architect immediately in writing.

1.12 UTILITY COORDINATION

A. Permanent: Provide all ancillary work necessary to obtain utility connections. Pay connection fees. Arrange for connection in a timely manner. Coordinate time and arrangement of other work with the serving utility, and comply with utility standards.

B. Temporary: Refer to Division 1.

C. General: The contractor shall verify to his own satisfaction the location, elevation and availability of all utilities and services required, and shall adequately inform himself as to their relation to the work. The contractor shall also verify location, conduct all necessary tests, inspections, coordinate with owner’s representatives and utilities, and check or existing underground utilities and lines before ditching. Repair of any cut or damaged lines or utilities shall be the sole responsibility of the contractor.

1.13 LISTING AND LABELING

Materials required to be listed shall be listed and labeled for the particular service if a listing is available. Obtain and comply with the terms of listings. Listed material include.

A. NSF: Potable water and sanitary waste systems components.

B. UL: Electrical materials.

C. AMCA: Air moving devices and related accessory items.

D. ARI: HVAC equipment.

E. FM or UL: Hazardous fluid and fire protection system components.

F. FIA, FM or AGA: Fuel gas system components.

1.14 MATERIALS AND EQUIPMENT

A. All materials and equipment shall be new. Products shall be currently manufactured.

B. All materials and equipment shall be clearly marked, stamped or labeled for identification. Do not obscure nameplates. Where manufactures nameplates do not meet the requirements of the mechanical identification specification provide nameplates in accordance with the specification.

C. All products of similar type shall be provided by a single manufacturer throughout the project.

1.15 SUBMITTALS AND REVIEW

A. Contractor shall furnish to the Architect, within a reasonable time after award of contract, and prior to commencing any work, complete brochures in quadruplicate (plus quantity required by the Contractor) of all materials and equipment which the contractor proposes to furnish on the project. Data shall include descriptive literature, performance data, diagrams, capacity information, etc., to substantiate that proposed equipment will meet all of the requirements of the plans and specifications.

B. All data must be checked and any required changes noted thereon by the contractor, signed and dated prior to furnishing same to the Architect for approval. Contractor's attention is directed that it is mandatory that he thoroughly review data prior to furnishing same to assure that equipment is in accordance with plans and specifications and to assure prompt return of the data.

C. Deviations: Specifically call to the attention of the Architect every proposed deviation from the Contract Document requirements. Failure to identify deviations as such constitutes a representation that all requirements are not met.

D. Review: Review of submittals shall not be constructed as releasing the Contractor from responsibility, but rather as a means to facilitate coordination of the work and the proper selection and installation of the products. All work shall be subject to final acceptance by the Architect at the completion of the project.

E. If above information is not provided complete as specified above and within the allocated time, all equipment shall be furnished exactly as specified without any substitutions.

1.16 SUBSTITUTIONS

A. Refer to the Conditions of the Contract.

B. Where one vendor is indicated for a product, it is to establish a level of quality and performance; provide a product equal to that product in all respects from a vendor of equivalent performance.

C. Where multiple vendors are indicated for a product, any of those vendors meeting the requirements may be submitted.

D. Some product specifications in this Division are of the Acceptable Manufacturer type. Vendors listed as Acceptable Manufacturers are acceptable as vendors. However, the product submitted is subject to review as being fully equivalent in detail to the basis of design.

E. Where multiple vendors are listed with product model numbers, each model and vendor is acceptable, provide all requirements are met. Model numbers are indicated to the extent believe necessary to identify a type and are not necessary completely.

F. The architectural/engineering team has designed the facility using requirements of the Basis of Design equipment. Any substitutions from the basis of design, which will require additional A/E design and/or coordination, shall include the cost of necessary redesign by professionals licensed in the respective disciplines and the approval of the professional of record.

1.17 DRAWINGS AND SPECIFICATIONS

A. These specifications are accompanied by Drawings. The Drawings and Specifications are complementary each to the other, and what is called for by one shall be as binding as if called for by both.

B. The Drawings are generally diagrammatic. Lay out work at the site to conform to existing conditions; architectural, structural, mechanical, and electrical conditions; to avoid all obstructions; and to conform to details of installation as required. Provide an integrated satisfactorily operating installation. All necessary offsets in piping, fittings, duct, etc., required to avoid interferences between piping, equipment, architectural, and structural elements shall be provided by the Contractor. Provide all necessary routing and offsets to avoid conflict.

C. Verify and arrange that sufficient space is provided for the installation of proposed products and that adequate access will exist for service and maintenance of equipment. For this work, adequate access shall be defined as meaning that service personnel can access and maintain a piece of equipment without having to alter permanent construction. Further, for equipment located above ceilings, access shall be available within 3 feet pf ceiling opening or lay-in ceiling.

1.18 COMPLEMENTARY DOCUMENTS

A. Contract documents are complementary; requirements are not necessarily repetitively stated at each possible subject; consider that a requirement applies wherever applicable.

B. In the event of conflicting requirements in different parts of the Documents, the more expensive shall be presumed to apply, unless the Architect clarifies the requirement in a less expensive manner and waives the more expensive requirement in writing.

Since codes and standards are incorporated by reference, a particular conflict may appear in that a reference may use language that implies that a particular requirement in the Construction Documents is waived under the reference. This is not the case, unless specifically so clarified by the Architect. Generally, the specific Drawings and Specifications take precedence over waivers in multi-purpose reference documents.

C. Because of licensure and workmanship requirements, persons performing the work are presumed to be familiar with applicable codes, ordinances, laws, regulations and standards. Therefore, details of materials, methods, arrangements and size contained in such publications

are not necessarily replicated in the Contract Documents. This in no way deletes the requirement of the Contractor to comply. In the event of an apparent conflict between such publications and the Contract Documents, request clarification from the Architect prior to construction.

1.19 PROTECTION

A. All work, equipment and materials shall be protected at all times to prevent damage or breakage either in transit, storage, installation or testing. All openings shall be closed with caps or plugs during installation. All materials and equipment shall be covered and protected against dirt, water, chemicals or mechanical injury.

1.20 CUTTING AND PATCHING

A. All subcontractors shall notify the General Contractor sufficiently ahead of construction of any floor, walls, ceiling, roof, etc., of any openings that will be required for his work. All necessary cutting of walls, floors, partitions, ceilings, etc., as required for the proper installation of the work under this Contract shall be done at the Subcontractor's expense in a neat and workmanlike manner.

1.21 DEMOLITION

A. It shall be the responsibility of the contractor to see that all demolition and remodeling work involving his trade is accomplished in a manner and completeness to provide the appearance of new construction work.

B. Coordinate with other divisions before commencing work.

C. Abandoned air conditioning units shall be removed and disposed of off site in a legal manner.

D. All abandoned and/or otherwise unused piping shall be securely capped using materials of the same composition as the original piping.

1.22 RECORD DOCUMENTS

A. Drawings: The Contractor shall maintain and update daily a set of "blueline" prints in the Field Office for the sole purpose of recording "installed" conditions. Revise the drawings to reflect as-built conditions, including all addenda, change orders, final shop drawing reviews, and field routing. Underground utilities shall be dimensionally located relative to readily accessible and identifiable permanent reference points, with accurate slope and elevation indicated. Submit prints for review. Revise, certify accuracy, and provide two final sets to the Architect.

B. Owner's Manual: Prior to final acceptance, provide two bound volumes to the Architect. Index by subject. Include corrected submittals and shop drawings that reflect final review comments; installation, operation and maintenance instructions, parts lists, wiring diagrams, and piping diagrams; warranties.

1.23 INSPECTION, OBSERVATION, AND TESTING

A. Cooperate with Architect's representative and authorities having jurisdiction. Provide complete access to the work at reasonable times.

B. Cover-up: Prior to covering up work, or conducting observed tests, request observation as appropriate. Provide adequate advance notice defined as a minimum of five working days. In some cases the Architect's representative may waive observation; otherwise arrange for observed construction and testing prior to cover-up. Should minimize required notice not to be provided and the contractor covers up work requiring observation, such work shall be uncovered at contractor's expense.

C. Pre-Testing: Self-inspect, pre-test, and remedy work prior to performing observed test.

D. Sectional Work: In circumstances where a requirement for phased construction or other considerations dictate sectional construction and/or testing, notify the Architect when construction begins on the first section of a system, and when the first section will be ready for observed testing, as well as subsequent sections. Test in the largest practical sections.

1.24 REFERENCE TO OTHER DIVISIONS

A. Refer to Division 26 for additional material requirements of electrical components provided under Division 23, such as loose starters, wiring and devices integral to equipment.

B. Refer to Division 2 for additional requirements governing excavation and backfill, supplemental to the requirements stated in this Division 23.

C. Comply with all requirements applicable to work required under this Division.

1.25 TESTING SERVICES

A. Additional Testing: In addition to any specified testing, the Architect may cause additional testing to be performed by an independent testing laboratory or any other qualified party. If such testing reveals deficient work by the Contractor, the Contractor shall pay for both the testing and remedial work. If such testing does not reveal deficient work by the Contractor, the Owner shall pay for the testing and the cost of repairing any damage caused by such testing.

B. Specified Testing Services: If independent testing services are specified regarding work under this Division, cooperate fully with the testing agency. Provide access to the work. Provide test holes and taps necessary. Remove work that is not tested on site, deliver to testing agency, and reinstall if undamaged; replace if damaged. Provide utilities, operational capability, and facilities for on-site testing as necessary.

END OF SECTION 230510

SECTION 23 05 15
MATERIALS AND METHODS

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 basic mechanical materials and methods to complement other Division 23 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete base construction requirements.
3. Escutcheons.
4. Dielectric fittings.
5. Flexible connectors.
6. Mechanical sleeve seals.
7. Equipment nameplate data requirements.
8. Labeling and identifying mechanical systems and equipment is specified in Division 23 Section "Mechanical Identification."
9. Nonshrink grout for equipment installations.
10. Field-fabricated metal and wood equipment supports.
11. Installation requirements common to equipment specification sections.
12. Mechanical demolition.
13. Cutting and patching.
14. Touchup painting and finishing.

B. Pipe and pipe fitting materials are specified in Division 23 piping system Sections.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. NP: Nylon plastic.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. CR: Chlorosulfonated polyethylene synthetic rubber.
2. EPDM: Ethylene propylene diene terpolymer rubber.

1.4 SUBMITTALS

A. Product Data Book: Submit product data for all Division 23 items in a single reinforced 3-ring binder. Organize product data by specification section number. Provide table of contents showing the following:
1. Specification Section
2. Description of item
3. Submission number (1st submission, 2nd submission, etc.)
4. Submittal status (Approved, Revise and Resubmit, etc.)

B. Product Data: For dielectric fittings, flexible connectors, mechanical sleeve seals, and identification materials and devices.

C. Shop Drawings: Detail fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.

D. Coordination Drawings: For access panel and door locations.

E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:

1. Planned piping layout, including valve and specialty locations and valve-stem movement.
2. Clearances for installing and maintaining insulation.
3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
4. Equipment and accessory service connections and support details.
5. Exterior wall and foundation penetrations.
6. Fire-rated wall and floor penetrations.
7. Sizes and location of required concrete pads and bases.
8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.

F. Samples: Of color, lettering style, and other graphic representation required for each identification material and device.

1.5 QUALITY ASSURANCE

A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

B. Equipment Selection: Equipment of higher electrical characteristics, physical dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. Additional costs shall be approved in advance by appropriate Contract Modification for these increases. If minimum energy ratings or efficiencies of equipment are specified, equipment must meet design and commissioning requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and prevent entrance of dirt, debris, and moisture.

B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor, if stored inside.

C. Protect flanges, fittings, and piping specialties from moisture and dirt.

D. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

D. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.

E. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.

F. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

G. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

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, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:

    a. Capitol Manufacturing Co.
    b. Central Plastics Co.
    c. Eclipse, Inc.; Rockford-Eclipse Div.
    d. Epco Sales Inc.
    e. Hart Industries International, Inc.
    f. Watts Industries, Inc.; Water Products Div.
    g. Zurn Industries, Inc.; Wilkins Div.

2. Dielectric Flanges:

    a. Capitol Manufacturing Co.
    b. Central Plastics Co.
    c. Epco Sales Inc.
    d. Watts Industries, Inc.; Water Products Div.

3. Dielectric-Flange Insulating Kits:

    a. Calpico, Inc.
    b. Central Plastics Co.

4. Dielectric Couplings:

    a. Calpico, Inc.
    b. Lochinvar Corp.

5. Dielectric Nipples:

    a. Grinnell Corp.; Grinnell Supply Sales Co.
    b. Perfection Corp.
    c. Victaulic Co. of America.

6. Metal, Flexible Connectors:

    a. ANAMET Industrial, Inc.
    b. Central Sprink, Inc.
    c. Flexicraft Industries.
    d. Flex-Weld, Inc.
    e. Grinnell Corp.; Grinnell Supply Sales Co.
    f. Hyspan Precision Products, Inc.
    g. McWane, Inc.; Tyler Pipe; Gustin-Bacon Div.
    h. Mercer Rubber Co.
    i. Metraflex Co.
    j. Proco Products, Inc.
    k. Uniflex, Inc.

7. Rubber, Flexible Connectors:

    a. General Rubber Corp.
    b. Mercer Rubber Co.
    c. Metraflex Co.
    d. Proco Products, Inc.
    e. Red Valve Co., Inc.
    f. Uniflex, Inc.

8. Mechanical Sleeve Seals:

    a. Calpico, Inc.
    b. Metraflex Co.
    c. Thunderline/Link-Seal.

2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 23 piping Sections for pipe and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness, unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32.

1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
2. Alloy E: Approximately 95 percent tin and 5 percent copper, with 0.10 percent maximum lead content.
3. Alloy HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
4. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.
5. Alloy Sb5: 95 percent tin and 5 percent antimony, with 0.20 percent maximum lead content.

F. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. BAg1: Silver alloy.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements: Manufacturer's standard solvent cements for the following:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

I. Plastic Pipe Seals: ASTM F 477, elastomeric gasket.

J. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.

K. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.

1. Sleeve: ASTM A 126, Class B, gray iron.
2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
3. Gaskets: Rubber.
4. Bolts and Nuts: AWWA C111.
5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure as required to suit system pressures.

G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.5 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:

1. 2-Inch NPS and Smaller: Threaded.
2. 2-1/2-Inch NPS and Larger: Flanged.
3. Option for 2-1/2-Inch NPS and Larger: Grooved for use with keyed couplings.

B. Bronze-Hose, Flexible Connectors: Corrugated, bronze, inner tubing covered with bronze wire braid. Include copper-tube ends or bronze flanged ends, braze welded to hose.

C. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

D. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

E. Rubber, Flexible Connectors: CR or EPDM elastomer rubber construction, with multiple plies of NP fabric, molded and cured in hydraulic presses. Include 125-psig minimum working-pressure rating at 220 deg F. Units may be straight or elbow type, unless otherwise indicated.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular design, with interlocking rubber links shaped to continuously fill annular space between pipe and sleeve. Include connecting bolts and pressure plates.

2.7 PIPING SPECIALTIES

A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:

1. Steel Sheet Metal: 0.0239-inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

    a. Underdeck Clamp: Clamping ring with set screws.

5. PVC: Manufactured, permanent, with nailing flange for attaching to wooden forms.
6. PVC Pipe: ASTM D 1785, Schedule 40.
7. PE: Manufactured, reusable, tapered, cup shaped, smooth outer surface, with nailing flange for attaching to wooden forms.

B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.

1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
2. OD: Completely cover opening.
3. Cast Brass: One piece, with set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

4. Cast Brass: Split casting, with concealed hinge and set screw.

    a. Finish: Rough brass.
    b. Finish: Polished chrome-plate.

5. Stamped Steel: One piece, with set screw and chrome-plated finish.
6. Stamped Steel: One piece, with spring clips and chrome-plated finish.
7. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
9. Stamped Steel: Split plate, with exposed-rivet hinge, set screw, and chrome-plated finish.
10. Stamped Steel: Split plate, with exposed-rivet hinge, spring clips, and chrome-plated finish.
11. Cast-Iron Floor Plate: One-piece casting.

2.8 IDENTIFYING DEVICES AND LABELS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 Sections. If more than one type is specified for application, selection is Installer's option, but provide one selection for each product category.

B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped; permanently fastened to equipment.

1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
2. Location: Accessible and visible location.

C. Stencils: Standard stencils, prepared for required applications with letter sizes complying with recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inch- high letters for ductwork and not less than 3/4-inch- high letters for access door signs and similar operational instructions.

1. Material: Fiberboard.
2. Material: Brass.
3. Stencil Paint: Standard exterior-type stenciling enamel; black, unless otherwise indicated; either brushing grade or pressurized spray-can form and grade.
4. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap on, color-coded, complying with ASME A13.1.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.

F. Plastic Duct Markers: Manufacturer's standard color-coded, laminated plastic. Comply with the following color code:

1. Green: Cold air.
2. Yellow: Hot air.
3. Yellow/Green or Green: Supply air.
4. Blue: Exhaust, outside, return, and mixed air.
5. For hazardous exhausts, use colors and designs recommended by ASME A13.1.
6. Nomenclature: Include the following:

a. Direction of airflow.
b. Duct service.
c. Duct origin.
d. Duct destination.
e. Design cubic feet per meter.

G. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated.

1. Fabricate in sizes required for message.
2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
3. Punch for mechanical fastening.
4. Thickness: 1/16 inch, unless otherwise indicated.
5. Thickness: 1/8 inch, unless otherwise indicated.
6. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches long; 1/8 inch for larger units.
7. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.

H. Plastic Equipment Markers: Color-coded, laminated plastic. Comply with the following color code:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Yellow/Green: Combination cooling and heating equipment and components.
4. Brown: Energy reclamation equipment and components.
5. Blue: Equipment and components that do not meet any criteria above.
6. For hazardous equipment, use colors and designs recommended by ASME A13.1.
7. Nomenclature: Include the following, matching terminology on schedules as closely as possible:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.

8. Size: Approximate 2-1/2 by 4 inches for control devices, dampers, and valves; and 4-1/2 by 6 inches for equipment.

I. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.

1. Multiple Systems: If multiple systems of same generic name are indicated, provide identification that indicates individual system number and service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.9 GROUT

A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.

1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psig, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 23 piping Sections specify unique piping installation requirements.

B. General Locations and Arrangements: 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.

C. Install piping at indicated slope.

D. Install components with pressure rating equal to or greater than system operating pressure.

E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.

F. Install piping free of sags and bends.

G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.

I. Install piping to allow application of insulation plus 1-inch clearance around insulation.

J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

K. Install fittings for changes in direction and branch connections.

L. Install couplings according to manufacturer's written instructions.

M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:

1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish. Use split-casting escutcheons if required, for existing piping.
2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.

N. Sleeves are not required for core drilled holes.

O. Permanent sleeves are not required for holes formed by PE removable sleeves.

P. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

Q. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Build sleeves into new walls and slabs as work progresses.
3. Install sleeves large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

   a. PVC Pipe Sleeves: For pipes smaller than 6-inch NPS.
   b. Steel Pipe Sleeves: For pipes smaller than 6-inch NPS.
   c. Steel, Sheet-Metal Sleeves: For pipes 6-inch NPS and larger, penetrating gypsum-board partitions.
   d. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

      1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Division 7 Section "Joint Sealants" for materials.
5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

R. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

S. Underground, Exterior-Wall, Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.

T. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Division 7 Section "Firestopping" for materials.

U. Verify final equipment locations for roughing-in.

V. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

W. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
4. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube."
5. Soldered Joints: Construct joints according to CDA's "Copper Tube Handbook."
6. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
7. 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:

    a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
    c. Align threads at point of assembly.
    d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    e. 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.

8. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
9. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
10. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. ABS Piping: ASTM D 2235 and ASTM D 2661.
    c. CPVC Piping: ASTM D 2846 and ASTM F 493.
    d. PVC Pressure Piping: ASTM D 2672.
    e. PVC Nonpressure Piping: ASTM D 2855.
    f. PVC to ABS Nonpressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

11. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657 procedures and manufacturer's written instructions.

    a. Plain-End Pipe and Fittings: Use butt fusion.
    b. Plain-End Pipe and Socket Fittings: Use socket fusion.

X. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.

C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

E. Install equipment giving right of way to piping installed at required slope.

F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.3 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.
2. Plastic markers, with application systems. Install on insulation segment if required for hot, uninsulated piping.
3. Locate pipe markers as follows if piping is exposed in finished spaces, machine rooms, and accessible maintenance spaces, such as shafts, tunnels, plenums, and exterior nonconcealed locations:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for fixtures and terminal units. Mark each pipe at branch, if flow pattern is not obvious.
    c. Near locations if pipes pass through walls, floors, ceilings, or enter nonaccessible enclosures.
    d. At access doors, manholes, and similar access points that permit view of concealed piping.

e. Near major equipment items and other points of origination and termination.
f. Spaced at maximum of 50-foot intervals along each run. Reduce intervals to 25 feet in congested areas of piping and equipment.
g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum 1/4-inch- high lettering for name of unit if viewing distance is less than 24 inches, 1/2-inch- high lettering for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish between multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers; or provide stenciled signs and arrows, showing duct system service and direction of flow.

1. Location: In each space, if ducts are exposed or concealed by removable ceiling system, locate signs near points where ducts enter into space and at maximum intervals of 50 feet.

D. Adjusting: Relocate identifying devices as necessary for unobstructed view in finished construction.

3.4 PAINTING AND FINISHING

A. Refer to Division 9 Section "Painting" for paint materials, surface preparation, and application of paint.

B. Apply paint to exposed piping according to the following, unless otherwise indicated:

1. Interior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
2. Interior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
3. Interior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include finish coat over enamel undercoat and primer.
4. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
5. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.
6. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Do not paint piping specialties with factory-applied finish.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psig, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage to support and anchor mechanical materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.8 DEMOLITION

A. Disconnect, demolish, and remove Work specified in Division 23 Sections.

B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Work Abandoned in Place: Cut and remove underground pipe a minimum of 2 inches beyond face of adjacent construction. Cap and patch surface to match existing finish.

E. Removal: Remove indicated equipment from Project site.

F. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.9 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.10 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 230515

SECTION 23 05 29
HANGERS AND SUPPORTS

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 hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

B. Related Sections include the following:

1. Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 21 Section "Fire-Suppression Piping" for pipe hangers for fire-protection piping.
3. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
4. Division 23 Section(s) "Metal Ducts” for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Fiberglass pipe hangers.
3. Thermal-hanger shield inserts.
4. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Fiberglass strut systems. Include Product Data for components.
4. Pipe stands. Include Product Data for components.
5. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1**, "**Structural Welding Code—Steel**"**

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. 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.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Available Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers: Similar to MSS Type 1, steel pipe hanger except hanger is made of fiberglass and continuous-thread rod and nuts are made of polyurethane or stainless steel.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Champion Fiberglass, Inc.
c. Cope, T. J., Inc.; Tyco International, Ltd.
d. Seasafe, Inc.
e. Unistrut Corp.; Tyco International, Ltd.
f. Wesanco, Inc.

B. Strap-Type, Fiberglass Pipe Hangers: Made of fiberglass loop with stainless-steel continuous-thread rod, nuts, and support hook.

1. Available Manufacturers:

a. Plasti-Fab, Inc.

2.5 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.6 FIBERGLASS STRUT SYSTEMS

A. Description: Shop- or field-fabricated pipe-support assembly, similar to MFMA-3, made of fiberglass channels and other components.

B. Available Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Champion Fiberglass, Inc.
3. Cope, T. J., Inc.; Tyco International Ltd.
4. Seasafe, Inc.

2.7 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Available Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.

5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.8 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.

1. Available Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Available Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.9 PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Available Manufacturers:

a. MIRO Industries.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Available Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.
c. Portable Pipe Hangers.

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Available Manufacturers:

a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.10 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.11 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, 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 (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified 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 padded hangers for piping that is subject to scratching.

F. 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 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).

11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
16. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

G. 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 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. 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 (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. 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. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. 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 (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. 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.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.

6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel 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 building structure.

B. 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 above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) 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.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 7 Section "Roof Accessories" for curbs.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

K. 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.

L. Install lateral bracing with pipe hangers and supports to prevent swaying.

M. 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 (DN 65)**] 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.

N. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

P. Insulated Piping: Comply with the following:

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 according to ASME B31.1 for power piping and 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 (DN 100) 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 (DN 100) 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 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 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 smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 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 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 contours of welded surfaces match adjacent contours.

3.5 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.

3.6 PAINTING

A. Touch Up: 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 minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

SECTION 23 05 53
MECHANICAL IDENTIFICATION

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. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.
4. Stencils.
5. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) 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 (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), 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.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 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 partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. 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 (38 mm) high.

2.3 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) 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 (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), 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. 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 (38 mm) high.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches (32 mm) for ducts; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Stainless steel, 0.025-inch (0.64-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

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 (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch (25 mm) high is needed for proper identification because of distance from normal location of required identification.

C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

END OF SECTION 230553

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING

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 TAB to produce design objectives for the following:

1. Air Systems:

    a. Constant-volume air systems.
    b. Variable-air-volume systems.

2. Hydronic Piping Systems:
    a. Primary-secondary systems.
3. Kitchen hood airflow balancing.
4. Indoor-air quality measuring.
5. Verifying that automatic control devices are functioning properly.
6. Reporting results of activities and procedures specified in this Section.

1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

M. TAB: Testing, adjusting, and balancing.

N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

O. Test: A procedure to determine quantitative performance of systems or equipment.

P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

1.4 SUBMITTALS

A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 45 days from Contractor's Notice to Proceed, submit 4 copies of the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 90 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

D. Certified TAB Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

E. Sample Report Forms: Submit two sets of sample TAB report forms.

F. Warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. TAB Firm Qualifications: Engage a TAB firm certified by either AABC or NEBB.

B. TAB Conference: Meet with Owner's and Architect's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the

participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

    a. Submittal distribution requirements.
    b. The Contract Documents examination report.
    c. TAB plan.
    d. Work schedule and Project-site access requirements.
    e. Coordination and cooperation of trades and subcontractors.
    f. Coordination of documentation and communication flow.

C. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that TAB team complied with approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard forms from TAB firm's forms approved by Engineer.

E. Instrumentation Type, Quantity, and Accuracy: As described in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."

F. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

1.6 PROJECT CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.8 WARRANTY

A. Guarantee: Provide a guarantee on AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" forms stating that AABC will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents or provide a guarantee on NEBB forms stating that NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee shall include the following provisions:

1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
2. Systems are balanced to optimum performance capabilities within design and installation limits.

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.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine Project Record Documents described in Division 1 Section "Project Record Documents."

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 equipment performance data including fan and pump curves. 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. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

F. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

G. Examine system and equipment test reports.

H. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

I. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

J. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

K. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

L. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

M. Examine strainers for clean screens and proper perforations.

N. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

O. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

P. Examine system pumps to ensure absence of entrained air in the suction piping.

Q. Examine equipment for installation and for properly operating safety interlocks and controls.

R. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.
5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.

S. 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 system readiness reports. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. 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 AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, 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. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

E. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling unit components.

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 fan static pressures to determine actual static pressure as follows:

    a. Measure outlet static pressure as far downstream from the fan as practicable 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 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.

2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
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 modes 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 static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

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. 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 terminal 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 terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using 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 VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make

this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.

5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.

    a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record the final fan performance data.

3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.8 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

E. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.10 PROCEDURES FOR PRIMARY-SECONDARY-FLOW HYDRONIC SYSTEMS

A. Balance the primary system crossover flow first, then balance the secondary system.

3.11 PROCEDURES FOR HEAT EXCHANGERS

A. Measure water flow through all circuits.

B. Adjust water flow to within specified tolerances.

C. Measure inlet and outlet water temperatures.

D. Check the setting and operation of safety and relief valves. Record settings.

3.12 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
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 for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.13 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
3. Power factor if factory-installed instrumentation is furnished for measuring kilowatt.
4. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatt.
5. Capacity: Calculate in tons of cooling.
6. If air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

3.14 PROCEDURES FOR HEAT-TRANSFER COILS

A. Water Coils: Measure the following data for each coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Electric-Heating Coils: Measure the following data for each coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

3.15 PROCEDURES FOR TEMPERATURE MEASUREMENTS

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.

C. Measure outside-air, wet- and dry-bulb temperatures.

3.16 PROCEDURES FOR COMMERCIAL KITCHEN HOODS

A. Measure, adjust, and record the airflow of each kitchen hood. For kitchen hoods designed with integral makeup air, measure and adjust the exhaust and makeup airflow. Measure airflow by duct Pitot-tube traverse. If a duct Pitot-tube traverse is not possible, provide an explanation in the report of the reason(s) why and also the reason why the method used was chosen.

1. Install welded test ports in the sides of the exhaust duct for the duct Pitot-tube traverse. Install each test port with a threaded cap that is liquid tight.

B. After balancing is complete, do the following:

1. Measure and record the static pressure at the hood exhaust-duct connection.
2. Measure and record the hood face velocity. Make measurements at multiple points across the face of the hood. Perform measurements at a maximum of 12 inches (300 mm) between points and between any point and the perimeter. Calculate the average of the measurements recorded. Verify that the hood average face velocity complies with the Contract Documents and governing codes.
3. Check the hood for capture and containment of smoke using a smoke emitting device. Observe the smoke pattern. Make adjustments to room airflow patterns to achieve optimum results.

C. Visually inspect the hood exhaust duct throughout its entire length in compliance with authorities having jurisdiction. Begin at the hood connection and end at the point it discharges outdoors. Report findings.

1. Check duct slopes as required.
2. Verify that duct access is installed as required.
3. Verify that point of termination is as required.
4. Verify that duct air velocity is within the range required.
5. Verify that duct is within a fire-rated enclosure.

D. Report deficiencies.

3.17 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Check the operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Check free travel and proper operation of control devices such as damper and valve operators.

F. Check the sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water flow measurements. Note the speed of response to input changes.

G. Check the interaction of electrically operated switch transducers.

H. Check the interaction of interlock and lockout systems.

I. Check main control supply-air pressure and observe compressor and dryer operations.

J. Record voltages of power supply and controller output. Determine whether the system operates on a grounded or nongrounded power supply.

K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.18 TOLERANCES

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Cooling-Water Flow Rate: 0 to minus 5 percent.

3.19 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: As Work progresses, prepare 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.

3.20 FINAL REPORT

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
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 firm 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, type size, and fittings.
14. Notes to explain why certain final data in the body of reports varies from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, 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.

E. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outside, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

F. Vibration Measurement Reports:

1. Date and time of test.
2. Vibration meter manufacturer, model number, and serial number.
3. Equipment designation, location, equipment, speed, motor speed, and motor horsepower.
4. Diagram of equipment showing the vibration measurement locations.
5. Measurement readings for each measurement location.
6. Calculate isolator efficiency using measurements taken.
7. Description of predominant vibration source.

G. Sound Measurement Reports: Record sound measurements on octave band and dBA test forms and on an NC or RC chart indicating the decibel level measured in each frequency band for both "background" and "HVAC system operating" readings. Record each tested location on a separate NC or RC chart. Record the following on the forms:

1. Date and time of test. Record each tested location on its own NC curve.
2. Sound meter manufacturer, model number, and serial number.
3. Space location within the building including floor level and room number.
4. Diagram or color photograph of the space showing the measurement location.
5. Time weighting of measurements, either fast or slow.
6. Description of the measured sound: steady, transient, or tonal.
7. Description of predominant sound source.

H. Indoor-Air Quality Measurement Reports for Each HVAC System:

1. HVAC system designation.
2. Date and time of test.
3. Outdoor temperature, relative humidity, wind speed, and wind direction at start of test.
4. Room number or similar description for each location.
5. Measurements at each location.
6. Observed deficiencies.

I. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.21 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

a. Measure airflow of at least 10 percent of air outlets.
b. Measure water flow of at least 5 percent of terminals.
c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
d. Measure sound levels at two locations.
e. Measure space pressure of at least 10 percent of locations.
f. Verify that balancing devices are marked with final balance position.
g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Architect.
3. Architect shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in 4-hours.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

3.22 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional testing and balancing 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 testing, inspecting, and adjusting during near-peak summer and winter conditions.

3.27 DUCT LEAKAGE TESTING

A. Contractor shall prepare ductwork for leakage testing by test and balance firm. Refer to requirements of Section 233113 for those duct sections being tested. Contractor shall remake any joints and/or duct runs which do not comply with maximum allowable leakage rates for retest and balance firm. Mechanical Contractor shall be responsible for any compensation due to the test and balance firm for additional testing required as a result of initial system failure.

B. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
   1. Test ductwork assemblies in excess of 1-1/2 inch static pressure class installed by Mechanical Contractor.
   2. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
   3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500 to 2500 Pa).

END OF SECTION 230593

SECTION 23 07 13
HVAC 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 mechanical insulation for duct, equipment, and pipe, including the following:

1. Insulation Materials:

    a. Phenolic Foam.
    b. Cellular glass.
    c. Flexible elastomeric.
    d. Mineral fiber.

2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Lagging adhesives.
7. Sealants.
8. Factory-applied jackets.
9. Field-applied fabric-reinforcing mesh.
10. Field-applied cloths.
11. Field-applied jackets.
12. Tapes.
13. Securements.
14. Corner angles.

1.3 DEFINITIONS

A. ASJ: All-service jacket.

B. FSK: Foil, scrim, kraft paper.

C. FSP: Foil, scrim, polyethylene.

D. PVDC: Polyvinylidene chloride.

E. SSL: Self-sealing lap.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, identify thermal conductivity, thickness, and jackets (both factory and field applied, if any).

B. Shop Drawings: Show details for the following:

1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Insulation application at pipe expansion joints for each type of insulation.
3. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Removable insulation at piping specialties, equipment connections, and access panels.
5. Application of field-applied jackets.
6. Application at linkages of control devices.
7. Field application for each equipment type.

C. Installer Certificates: Signed by Contractor certifying that installers comply with requirements.

D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

E. Field quality-control inspection reports.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, and cement material containers, with appropriate markings of applicable testing and inspecting 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 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.

2.2 INSULATION MATERIALS

A. Refer to Part 3 schedule articles for requirements about 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. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

   a. ACS.
   b. Pittsburgh Corning Corporation; Foamglas Super K.
2. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
3. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Available Products:

   a. Aeroflex USA Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

H. 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 Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

   a. CertainTeed Corp.; Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Duct Wrap.
   d. Owens Corning; All-Service Duct Wrap.

I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in Part 2 "Factory-Applied Jackets" Article.

1. Available Products:

   a. CertainTeed Corp.; Commercial Board.
   b. Johns Manville; 800 Series Spin-Glas.
   c. Knauf Insulation; Insulation Board.
   d. Owens Corning; Fiberglas 700 Series.

J. Mineral-Fiber, Preformed Pipe Insulation:

1. Available Products:
   a. Johns Manville; Micro-Lok.

b. Knauf Insulation; 1000(Pipe Insulation.
c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) 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 Part 2 "Factory-Applied Jackets" Article.

2.3 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is UL tested and certified to provide a 1 or 2-hour fire rating, as required.

1. Products:

a. CertainTeed Corp.; FlameChek.
b. Johns Manville; Firetemp Wrap.
c. Thermal Ceramics; FireMaster Duct Wrap.
d. 3M; Fire Barrier Wrap Products.

2.4 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.5 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. Cellular-Glass Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F (minus 59 to plus 149 deg C).

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

F. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products:

2.6 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products:

a. Childers Products, Division of ITW; CP-30.
b. Foster Products Corporation, H. B. Fuller Company; 30-35.
c. ITW TACC, Division of Illinois Tool Works; CB-25.
d. Marathon Industries, Inc.; 501.
e. Mon-Eco Industries, Inc.; 55-10.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

2.7 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
2. Service Temperature Range: Minus 50 to plus 180 deg F (Minus 46 to plus 82 deg C).
3. Color: White.

2.8 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Products:

a. Childers Products, Division of ITW; CP-76.
b. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).

4. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: White.

2.9 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.

2.10 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. inch (4 strands by 4 strands/sq. mm) for covering pipe and pipe fittings.

B. Woven Glass-Fiber Fabric for Duct and Equipment Insulation: Approximately 6 oz./sq. yd. (203 g/sq. m) with a thread count of 5 strands by 5 strands/sq. inch (2 strands by 2 strands/sq. mm) for covering equipment.

2.11 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd. (271 g/sq. m).

2.12 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. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness 20 mil; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

4. Factory-fabricated tank heads and tank side panels.

D. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.
    b. Thickness: 0.020" Smooth.
    c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
    d. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
    e. Factory-Fabricated Fitting Covers:

        1) Same material, finish, and thickness as jacket.
        2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
        3) Tee covers.
        4) Flange and union covers.
        5) End caps.
        6) Beveled collars.
        7) Valve covers.
        8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.13 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136 and UL listed.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. 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 and UL listed.

1. Width: 3 inches.
2. Thickness: 6.5 mils.

3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive and UL listed.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

2.14 SECUREMENTS

A. Bands:
1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing or closed seal.
2. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

a. 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.

D. Wire: 0.080-inch nickel-copper alloy.

2.15 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. 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 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 COMMON INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and 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 4 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and 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. Manholes.
5. Handholes.
6. Cleanouts.

3.4 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 Below-Grade 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. 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. Firestopping and fire-resistive joint sealers are specified in Division 7 Section "Through-Penetration Firestop Systems."

F. Insulation Installation at Floor Penetrations:

1. Duct: Install insulation continuously through floor penetrations that are not fire rated. 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. Pipe: Install insulation continuously through floor penetrations.
3. Seal penetrations through fire-rated assemblies according to Division 7 Section "Through-Penetration Firestop Systems."

3.5 DUCT AND PLENUM INSULATION INSTALLATION

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 50 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 capacitor-discharge-weld pins and speed washers 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.

3.6 EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of tank and vessel surfaces.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not overcompress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.
    g. 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.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from galvanized steel, at least 0.040 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

3.7 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, 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, vessels, and equipment. 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.

3.8 CELLULAR-GLASS INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of 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 services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but 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 cut sections of cellular-glass block insulation of same thickness as pipe 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. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. 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.

3.9 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

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.

3.10 MINERAL-FIBER INSULATION INSTALLATION

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 but 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.

E. 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 50 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 capacitor-discharge-weld pins and speed washers 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 (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) 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 (10 deg C) at 18-foot (5.5-m) 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 2 times the insulation thickness but not less than 3 inches (75 mm).

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.

F. 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 50 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 capacitor-discharge-weld pins and speed washers 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 (50 mm) from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) 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 (10 deg C) at 18-foot (5.5-m) 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 2 times the insulation thickness but not less than 3 inches (75 mm).

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.

3.11 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. 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.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. 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.

3.12 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous UL-listed fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 7 Section "Through-Penetration Firestop Systems."

3.13 FINISHES

A. Duct, Equipment, and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections. Paint only those items in exposed, public areas.

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.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent inspecting agency to perform field inspections and prepare inspection reports.

B. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements. Remove defective Work.

C. Install new insulation and jackets to replace insulation and jackets removed for inspection. Repeat inspection procedures after new materials are installed.

3.15 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 nonconditioned space.
4. Indoor, exposed return located in nonconditioned space.
5. Indoor, concealed oven and warewash exhaust.
6. Indoor, exposed oven and warewash exhaust.
7. Indoor, concealed exhaust air.
8. Indoor, exposed exhaust air.
9. Outdoor, concealed supply and return.
10. Outdoor, exposed supply and return.

B. Items Not Insulated:
1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums and casings.

4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.16 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

E. Concealed, rectangular, supply-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

F. Concealed, rectangular, return-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

H. Concealed, rectangular, exhaust-air duct insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

I. Concealed, return-air plenum insulation shall be the following:
   1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
   2. Mineral-Fiber Board: 1-1/2 inches thick and 2-lb/cu. ft. nominal density.

J. Exposed, round and flat-oval, supply-air duct insulation shall be the following:

   1. Double wall insulated duct (in finished spaces)

   2. Single wall insulated duct: 2-inches thick (in mechanical rooms and mezzanine)

K. Exposed, round and flat-oval, return-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick
   2. Insulation not required in conditioned spaces.

L. Exposed, round and flat-oval, outdoor-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick

M. Exposed, round and flat-oval, exhaust-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick.
   2. Insulation not required in conditioned spaces.

N. Exposed, rectangular, supply-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick. (include in mechanical rooms and mezzanine spaces).

O. Exposed, rectangular, return-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick (include in mechanical rooms and mezzanine spaces).
   2. Insulation not required in conditioned spaces.

P. Exposed, rectangular, outdoor-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick (include in mechanical rooms and mezzanine spaces).

Q. Exposed, rectangular, exhaust-air duct insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick (include in mechanical rooms and mezzanine spaces).
   2. Insulation not required in conditioned spaces.

R. Exposed, return-air plenum insulation shall be the following:
   1. Single wall insulated duct: 2-inches thick (include in mechanical rooms and mezzanine spaces).

3.17 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

B. Round, flat-oval, and rectangular supply-air duct insulation shall be the following:
   1. Flexible Elastomeric: 3 layers, each 1” thick.

C. Round,flat-oval, and rectangular return-air duct insulation shall be the following:
   1. Flexible Elastomeric: 3 layers, each 1” thick.

3.18 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Chillers: Insulate cold surfaces on chillers, including, but not limited to, evaporator bundles, suction piping, compressor inlets, tube sheets, water boxes, and nozzles with the following:
   1. Flexible Elastomeric: 1 inch thick.

D. Heat-exchanger (water-to-water for cooling service) insulation shall be the following:
   1. Flexible Elastomeric: 1 inch thick.

E. Chilled-water pump insulation shall be the following:

   1. Cellular Glass: 3 inches thick.

2. Phenolic Foam: 2 inches thick.

F. Condenser-water pump insulation shall be the following:
1. Not applicable.

G. Domestic water pump insulation shall be the following:
1. Not applicable.

H. Heating-hot-water pump insulation shall be the following:
1. Cellular Glass: 3 inches thick.

I. Chilled-water expansion/compression tank insulation shall be the following:
1. Flexible Elastomeric: 1 inch thick.

J. Chilled-water air-separator insulation shall be the following:
1. Flexible Elastomeric: 1 inch thick.

K. Domestic hot-water storage tank insulation shall be the following:

1. Mineral-Fiber Board: 4 inches thick and 2-lb/cu. ft. nominal density.

L. Thermal storage tank (brine, water, ice) insulation shall be the following:

1. Cellular Glass: 4 inches thick.

3.19 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. Fire-suppression piping.
2. Drainage piping located in crawl spaces.
3. Below-grade piping.
4. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.20 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
a. Flexible Elastomeric: 3/4 inch thick.

B. Chilled Water and Brine, above 40 Deg F:

1. NPS 4 DN 100 and Smaller: Insulation shall be the following:

a. Cellular Glass: 1-1/2 inches thick.

b. Phenolic Foam: 1 inch thick.

2. NPS 6 (DN 150) to NPS 12 (DN300: Insulation shall be the following:

a. Cellular Glass: 2 inches thick.

b. Phenolic Foam: 1 ½ inches thick.

3. NPS 14 (DN350) and Larger: Insulation shall be the following:

a. Cellular Glass: 2 - ½ inches thick.

b. Phenolic Foam: 2 inches thick.

C. Condenser-Water Supply and Return:

1. No insulation.

D. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. Insulation shall be the following:
a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

E. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
a. Flexible Elastomeric: 3/4 inch thick.

3.21 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water and Brine:

1. All Pipe Sizes: Insulation shall be the following:

a. Cellular Glass: Refer to interior schedule for thickness.

b. Phenolic Foam: Refer to interior schedule for thickness.

B. Condenser-Water Supply and Return:

1. All Pipe Sizes: Insulation not required.

C. Heating-Hot-Water Supply and Return, 200 Deg F and below:

1. All Pipe Sizes: Insulation shall be the following:
a. Mineral-Fiber Pipe Insulation, Type I: 1 ½ inches thick.

D. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
a. Flexible Elastomeric: 1 inch thick.

3.22 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Loose-fill insulation, for belowground piping, is specified in Division 2 piping distribution Sections.

B. Chilled Water, All Sizes: Use pre-insulated pipe system.

C. Condenser-Water Supply and Return, All Sizes: Insulation not required. Provide anti corrosion coating as specified in Hydronic Piping Specification.

D. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F and below: Use pre-insulated pipe system.

3.23 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. None.

E. Equipment, Concealed:

1. None.

F. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. None.

G. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. None.

H. Piping, Concealed:
1. ASJ – factory.

I. Piping, Exposed:
1. PVC: 20 mils thick.

3.24 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. Ducts and Plenums, Concealed:
1. Painted Aluminum, Smooth: 0.020 inch thick.

D. Ducts and Plenums, Exposed:
1. Painted Aluminum, Smooth: 0.020 inch thick.

E. Equipment, Concealed:
1. PVC: 20 mils thick.

F. Equipment, Exposed:

1. Aluminum, Smooth: 0.020 inch thick.

G. Piping, Concealed:
1. PVC: 20 mils thick.

H. Piping, Exposed:
1. Aluminum, Smooth: 0.020 inch thick.

3.25 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION

SECTION 23 31 13
METAL DUCTS

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. Section Includes:

1. Metal Ductwork.
2. Nonmetal ductwork.
3. Casing and plenums.
4. Kitchen hood ductwork.
5. Dishwasher exhaust ductwork.
6. Hangers and supports.

B. References:

1. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.
2. ASTM A 366/A 366M - Standard Specification for Commercial Steel (CS) Sheet, Carbon, (0.15 Maximum Percent) Cold Rolled; 1997.
3. ASTM A 569/A 569M - Standard Specification for Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial; 1998.
4. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 1998.
5. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems; National Fire Protection Association; 1996.
6. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 1996.
7. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 1994.
8. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; latest Edition.
9. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; 1996.

1.3 PERFORMANCE REQUIREMENTS

A. 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", latest edition and NFPA 90A.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.
3. Duct Construction Standards (DCS) for each pressure class required for this project. DCS shall include transverse and longitudinal joint type, any internal or external reinforcement and sheetmetal thickness and size for each pressure class.
4. Flexible duct manufacturer, type and product details.
5. Flexible connection materials and connection types.
6. Fitting fabrication details.
7. Damper details.
8. Description of hanger types and sizes for duct sizes used in this project. Hangers must comply with the latest edition of SMACNA's "HVAC Duct Construction Standards - Metal and Flexible". Hanger submittal should include hanger spacing to be used.

B. Coordination Drawings: Provide drawings indicating fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work. Minimum scale of ¼” = 1’0”. Coordinate duct location with other trades.

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 - PRODUCTS

2.1 SINGLE-WALL 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. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Construct with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible, provide a centerline radius of 1.0 times the width of duct. Where space constraints will not allow a centerline radius of 1.0 times the width of duct, provide rectangular elbows with double wall (airfoil) factory fabricated turning vanes installed on vane runner rails. Turning vanes shall not be used in bends other than 90 degrees.

1. Branch connections shall be 45 degree entry fittings.

C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. McGill AirFlow LLC.
2. SPOT
3. SEMCO

B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated. If duct is exposed to the weather, provide a continuous sheetmetal hat channel over all transverse joints and position openings in longitudinal seams facing in the direction of possible water flow. Provide a flexible, adhesive aluminum jacket designed for this application over entire duct surface per manufacturer’s recommendations.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.
5. Insulation thickness to be 2 inches.

E. Inner Duct: Minimum 0.028-inch (0.7-mm) solid sheet steel.

2.3 SINGLE-WALL ROUND AND FLAT-OVAL 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.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Lindab Inc.
    b. McGill AirFlow LLC.
    c. SEMCO Incorporated.
    d. Sheet Metal Connectors, Inc.
    e. SPOT

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).

C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," 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 36 Inches (1524 mm) in Diameter: Flanged.

D. Longitudinal Seams: Round and flat oval duct must be spiral seam ductwork. Longitudinal seam snap-lock duct will not be allowed.

E. Tees, Laterals and Bends: Fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "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."

1. Elbows and bends: Construct with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible, provide a centerline radius of 1.0 times the width of duct. Elbows shall be of gored, pleated or stamped construction. 90 degree bends shall be a minimum of 5-gore. 45 degree bends shall be a minimum of 3 gore. Adjustable elbows will not be allowed.

2. Branch connections shall be conical, 45 deg. entry or lateral fittings.

2.4 DOUBLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lindab Inc.
2. McGill AirFlow LLC.
3. SEMCO Incorporated.
4. SPOT

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension) of the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," 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."

    a. Transverse Joints in Ducts Larger Than 36 Inches (1524 mm) in Diameter: Flanged.

2. Longitudinal Seams: Round and flat oval duct must be spiral seam ductwork. Longitudinal seam snap-lock duct will not be allowed.

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "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."

    a. Elbows and bends: Construct with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible, provide a centerline radius of 1.0 times the width of duct. Elbows shall be of gored, pleated or stamped construction. 90 degree bends shall be a minimum of 5-gore. 45 degree bends shall be a minimum of 3 gore. Adjustable elbows will not be allowed.
    b. Branch connections shall be conical, 45 deg. entry or lateral fittings.

D. Inner Duct: Minimum 0.028-inch (0.7-mm) solid sheet steel.

E. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: [0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K)] at 75 deg F (24 deg C) mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

2.5 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 (Z275).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Tie Rods: Galvanized steel, 3/8-inch (10-mm) minimum diameter.

2.6 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CertainTeed Corporation; Insulation Group.
b. Johns Manville.
c. Knauf Insulation.
d. Owens Corning.

2. Maximum Thermal Conductivity:

a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) at 75 deg F (24 deg C) mean temperature.
b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F (0.033 W/m x K) at 75 deg F (24 deg C) mean temperature.

3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm (12.7 m/s) or where indicated.

9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.

    a. Sheet Metal Inner Duct Perforations: 3/32-inch (2.4-mm) diameter, with an overall open area of 23 percent.

10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.7 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 (2500 Pa), 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. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.8 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 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. 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.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. 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.

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 and flat-oval 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 (25 mm), 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 (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

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 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet (6 m) in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches (38 mm) from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal all duct 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. All duct: Seal Class A.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "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 (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) 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 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) 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 (5 m).

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.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "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 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

    a. Ducts with a Pressure Class Higher Than 3-Inch wg (750 Pa): Test representative duct sections, selected by Engineer from sections installed**,** totaling no less than 25 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Underground Ducts: Concrete-encased, PVC-coated, galvanized sheet steel**.**

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive [1-inch wg (250 Pa)]
b. SMACNA Leakage Class for Rectangular: 12
c. SMACNA Leakage Class for Round and Flat Oval: 12

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 1-inch wg (500 Pa), or round up the ESP listed in the equipment schedules and provide, whichever is greater.
b. SMACNA Leakage Class for Rectangular: 12
c. SMACNA Leakage Class for Round and Flat Oval: 12

3. Ducts Connected to Variable-Air-Volume Air-Handling Units prior to terminal units:

a. Pressure Class: Positive 3-inch wg (750 Pa)
b. SMACNA Leakage Class for Rectangular: 12
c. SMACNA Leakage Class for Round and Flat Oval: 12

C. Return, toilet exhaust and outside air ducts:

1. Pressure Class: Positive or negative 1-inch wg (250 Pa).
2. SMACNA Leakage Class for Rectangular: 12
3. SMACNA Leakage Class for Round and Flat Oval: 12

D. Special Exhaust Ducts:

1. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet.
b. Concealed: Type 304, stainless-steel sheet.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 4-inch wg (1000 Pa).
e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
f. SMACNA Leakage Class: 3.
g. Minimum 18 gauge or thickness required per local code, whichever is greater

2. Ducts Connected to Dishwasher Hoods:

    a. Type 304, stainless-steel sheet.
    b. Welded seams and flanged joints with watertight EPDM gaskets.
    c. Pressure Class: Positive or negative 2-inch wg (500 Pa).
    d. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
    e. SMACNA Leakage Class: 3.
    f. Minimum 18 gauge or thickness required per local code, whichever is greater

E. Duct Exposed to View

1. Supply Air Ducts: shall be double wall spiral round construction with 1” thick insulation in conditioned spaces and 2” insulation in unconditioned spaces.
2. Return and Exhaust Air Ducts: shall be un-insulated single wall spiral round construction in conditioned spaces and double wall round construction with 1” insulation in unconditioned spaces.

END OF SECTION

SECTION 23 33 00
DUCT 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. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Combination fire and smoke dampers.
7. Turning vanes.
8. Duct-mounting access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.
12. Louvers.

B. Related Sections include the following:

1. Section "Fire Alarm" for duct-mounting fire and smoke detectors.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Motorized control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Combination fire and smoke dampers.
7. Turning vanes.
8. Duct-mounting access doors.
9. Flexible connectors.
10. Flexible ducts.

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. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Fire-damper, smoke-damper, and combination fire- and smoke-damper installations, including sleeves and duct-mounting access doors.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 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.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M.

D. Aluminum Sheets: ASTM B 209 (ASTM B 209M), alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: ASTM B 221 (ASTM B 221M), alloy 6063, temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 BACKDRAFT DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. Ruskin Company.

B. Description: Multiple-blade, parallel action gravity balanced, with blades of maximum 6-inch (150-mm) width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

C. Frame: 20 gauge, galvanized sheet steel, with welded corners and mounting flange.

D. Blades: 0.025-inch- thick, roll-formed aluminum.

E. Blade Seals: Vinyl.

F. Blade Axles: Stainless Steel.

G. Tie Bars and Brackets: Galvanized steel.

H. Basis of Design: Ruskin S3G.

2.4 VOLUME DAMPERS

A. Manufacturers:
1. Flexmaster U.S.A., Inc.
2. METALAIRE, Inc.
3. Nailor Industries Inc.
4. Ruskin Company.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 2-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 22 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Single Skin Steel Blades: 22 gauge, galvanized sheet steel.
3. Blade Axles: Galvanized steel.
4. Bearings: Molded synthetic.
5. Tie Bars and Brackets: Aluminum.
6. Tie Bars and Brackets: Galvanized steel.
7. Basis of Design: Ruskin MD 15 (rectangular) and MDRS25 (round).

D. Jackshaft: 1-inch- (25-mm-) diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.

E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.5 MOTORIZED CONTROL DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.

B. General Description: AMCA-rated, parallel (return air applications) or opposed (outside air applications) blade design; minimum of 16 gauge thick, galvanized-steel frames with holes for duct mounting; minimum of 16 gauge thick, galvanized-steel damper blades with maximum blade width of 8 inches (203 mm).

1. Secure blades to 1/2-inch- (13-mm-) diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
3. Provide closed-cell neoprene edging rated for leakage at less than 10 cfm per sq. ft. of damper area, at differential pressure of 1-inch wg; when tested according to AMCA 500D.

C. Basis of Design: Ruskin CD35.

2.6 FIRE DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. METALAIRE, Inc.
4. Nailor Industries Inc.
5. Ruskin Company.

B. Fire dampers shall be labeled according to UL 555.

C. Fire Rating: 1-1/2 hours (3 hours as noed).

D. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 20 gauge galvanized steel; with mitered and interlocking corners.

E. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 20 gauge frame complies with sleeve requirements.

F. Mounting Orientation: Vertical or horizontal as indicated.

G. Blades: 24 gauge, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

H. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

I. Fusible Links: Replaceable, 165 deg F rated.

J. Basis of Design: 1-1/2 hour – Ruskin 1BD2-B (rectangular) and FDR25 (round), 3 hour – Ruskin 1BD2-B3 (rectangular)

2.7 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
1. CESCO Products.
2. Greenheck.
3. Nailor Industries Inc.
4. Ruskin Company.

B. General Description: Labeled according to UL 555S. Combination fire and smoke dampers shall be labeled according to UL 555 for 1-1/2-hour rating.

C. Fusible Links: Replaceable, 165 deg F rated.

D. Frame and Blades16 gauge, galvanized sheet steel.

E. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to suit wall or floor application.

F. Damper Motors: Modulating and two-position action.

1. Comply with requirements in Division 23 Section "Motors."
2. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
3. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
4. Outdoor Motors and Motors in Outside-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
5. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).
6. Electrical Connection: 115 V, single phase, 60 Hz.

G. Basis of Design: Ruskin FSD376.

2.8 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners shall automatically align vanes.

B. Manufactured Turning Vanes: Fabricate 1-1/2-inch- (38-mm-) wide, double-vane, curved blades of galvanized sheet steel set 3/4 inch (19 mm) o.c.; support with bars perpendicular to blades set 2 inches (50 mm) o.c.; and set into vane runners suitable for duct mounting.

C. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.9 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

1. Manufacturers:
   a. CESCO Products.
   b. Flexmaster U.S.A., Inc.
   c. Greenheck.
   d. Nailor Industries Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

   a. Less Than 12 Inches (300 mm) Square: Secure with two sash locks.
   b. Up to 18 Inches (450 mm) Square: Two hinges and two sash locks.
   c. Up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches.

d. Sizes 24 by 48 Inches (600 by 1200 mm) and Larger: One additional hinge.

C. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

D. Insulation: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corp.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Select metal compatible with ducts.

D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

E. 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. (810 g/sq. m).
2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

2.11 INSULATED ACOUSTICAL MEDIUM PRESSURE FLEXIBLE DUCT

A. Where flexible duct is shown on drawings, provide Flexmaster Type 8M UL 181 Class I Air Duct or equal.

B. The duct shall be constructed of a CPE fabric supported by helical wound galvanized steel. The fabric shall be mechanically locked to the steel helix without the use of adhesives or chemicals.

C. The internal working pressure rating shall be at least 6” w.g. positive and 4” w.g. negative with a bursting pressure of at least 2 ½ time the working pressure

D. The duct shall be rated for a velocity of at lease 4000 feet per minute.

E. The duct must be suitable for continuous operation at a temperature range of -20° F to +250° F.

F. Acoustical performance, when tested by an independent laboratory in accordance with the Air Diffusion Council's Flexible Air Duct Test Code FD 72-R1, Section 3.0, Sound Properties, shall be as follows:

1. The insertion loss (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	7	31	40	38	40	27
8" diameter	13	29	36	35	38	22
12" diameter	21	28	29	33	26	12

2. The radiated noise reduction (dB) of a 10 foot length of straight duct when tested in accordance with ASTM E477, at a velocity of 2500 feet per minute, shall be at least:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	5	8	7	8	11	15
8" diameter	10	7	7	8	10	13
12" diameter	9	6	6	5	9	13

3. The self generated sound power levels (LW) dB re 10^{-12} Watt of a 10 foot length of straight duct for an empty sheet metal duct when tested in accordance with ASTM E477, at a velocity of 1000 feet per minute, shall not exceed:

Octave Band	2	3	4	5	6	7
Hz.	125	250	500	1000	2000	4000
6" diameter	42	31	23	18	17	21
8" diameter	41	34	27	19	18	21
12" diam-	54	45	38	31	27	23

eter						

G. Factory insulate the flexible duct with fiberglass insulation. Provide insulation as required by ASHRAE 90.1.

H. Cover the insulation with a fire retardant metalized vapor barrier jacket reinforced with crosshatched scrim having a permeance of not greater than 0.05 perms when tested in accordance with ASTM #96, Procedure A.

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.

2.13 LOUVERS

A. Manufacturers:
1. Ruskin
2. Greenheck

B. Description: Stationary-type louver with blades designed to prevent the penetration of wind driven rain.
1. Extended sill to drain water to building exterior.
2. Extruded aluminum alloy as follows:
   a. 5” deep frame with 0.081” wall thickness.
   b. Blades shall be double drainable and sight proof.
   c. Provide with aluminum screen.

PART 3 - EXECUTION

3.1 APPLICATION AND 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. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

E. Provide test holes at fan inlets and outlets and elsewhere as indicated.

F. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

G. Install duct silencers independent of ducts with flexible duct connectors, lagged with loaded vinyl sheet on inlets and outlets where indicated.

H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

1. On both sides of duct coils.
2. Downstream from volume dampers and equipment.
3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.
4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot (15-m) spacing.
5. On sides of ducts where adequate clearance is available.

I. Install the following sizes for duct-mounting, rectangular access doors:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body Plus Ladder Access: 25 by 17 inches (635 by 430 mm).

J. Install the following sizes for duct-mounting, round access doors:

1. One-Hand or Inspection Access: 8 inches (200 mm) in diameter.
2. Two-Hand Access: 10 inches (250 mm) in diameter.
3. Head and Hand Access: 12 inches (300 mm) in diameter.
4. Head and Shoulders Access: 18 inches (460 mm) in diameter.
5. Body Access: 24 inches (600 mm) in diameter.

K. Label access doors according to Division 23 Section "Mechanical Identification."

L. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

M. For fans developing static pressures of 5-inch wg (1250 Pa) and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect diffusers or light troffer boots to low pressure ducts with maximum 60-inch (1500-mm) lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where indicated and required for testing and balancing purposes.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 23 Section "Testing, Adjusting, and Balancing."

END OF SECTION 233300

SECTION 23 37 13
DIFFUSERS, REGISTERS, AND GRILLES

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. Section Includes:
   1. Ceiling and wall mounted diffusers, registers, and grilles.

B. Related Sections:

   1. Division 8 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
   2. Division 23 Section "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 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 Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling 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. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
   3. Size and location of initial access modules for acoustical tile.
   4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
   5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.1 Manufacturers:

A.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. METALAIRE, Inc.
   b. Price Industries.
   c. Titus.

2. Refer to drawings for air device accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.

3.3 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 238130
DUCT-FREE SPLIT SYSTEMS

Part 1 – General

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

1.02 SUMMARY
- A. This Section includes Inverter Driven variable capacity, heat pump air conditioning split system.
    1. Wall-mounted indoor units
    2. Ceiling-mounted indoor units
    3. Outdoor condensing units

1.03 SUBMITTALS
- A. Product Data: Include rated capacities, operating 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 Diagreams: Power, signal, and control wiring.
    2. Dimensioned outline drawings of equipment unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
    3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Operation and Maintenance Data: For computer-room air-conditioning units to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE
- A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. The shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210 and bear the ARI label
- D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. The outdoor unit will be factory charged for a length of 33 feet of refrigerant with R410A refrigerant.
- F. A dry air holding charge shall be provided in the evaporator.

1.05 DELIVERY, STORAGE AND HANDLING
- A. Unit shall be stored and handled according to the manufacturer's recommendations.

1.06 WARRANTY
- A. Wall-mount units and associated condensing units:
    1. Units shall have a (5) year manufacturer's warranty from date of installation.
    2. Compressor shall have a (7) year manufacturer's warranty from date of installation
    3. Units shall have a (1) year limited labor warranty from date of installation.
- B. Ceiling Cassette indoor units and associated condensing units:

1. Units shall have a (1) year manufacturer's warranty from date of installation.
2. Compressor shall have a (6) year manufacturer's warranty from date of installation
3. Units shall have a (1) year limited labor warranty from date of installation.

C. During the stated period, should any part fail due to defects in material and/or workmanship, it shall be repaired or replaced. Manufacturer's labor warranty shall only cover the first year. Extended warranties are for parts only.

Part 2 – Performance

2.01 MANUFACTURERS

A. Daikin AC, contact Perry Mechanical Systems 956-683-1458
B. SANYO
C. EMI
D. TRANE
E. CARRIER
F. YORK

2.02 PERFORMANCE

A. The system performance shall be in accordance with ARI 210/240 test conditions as shown in the performance table below.
B. The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping.
C. The heating performance is based on 70°F DB / 60°F WB for the indoor unit and 47°F DB / 43°F WB for the outdoor unit and 25 feet of piping.

2.03 INDOOR UNIT – WALL MOUNT (3/4-ton to 2-ton)

General:

The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units. The unit shall have a self diagnostic function, 3-minute time delay mechanism, and have a factory pre-charge of R410A adequate for 33 feet of total length.

A. Unit Cabinet:
    1. The indoor unit shall have a white, "flat screen" finish.
    2. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom.
    3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
    4. The cabinet includes an "intelligent-eye" motion sensor capable of setting back the set point temperature for energy savings. This feature may be disengaged on the wireless remote controller.
B. Fan:
    1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
    2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
    3. Provide an auto-swing louver for adjustable air flow both vertically and horizontally via the wireless remote control furnished with each system.
    4. The indoor fan shall offer a choice of three speeds, High, Medium, and Low.
C. Filter:
    1. The return air filter provided will be a mildew proof, removable and washable filter.
D. Coil:

1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
2. All tube joints shall be brazed with silver alloy or phoscopper.
3. All coils shall be factory pressure tested.
4. A condensate pan shall be provided under the coil with a drain connection.

E. Electrical:
1. The outdoor unit shall be powered with 208/230 volts, 1 phase, and 60 hertz power. The indoor unit shall received 208/230 volt, 1 phase, 60 hertz power from the outdoor unit.
2. The allowable voltage range shall be 187 volts to 253 volts.

F. Control:
1. The unit shall have a wireless remote infra-red controller capable to operate the system. It shall have Automatic Operation, Dry Operation and Fan Only Operation.
2. The infrared remote controller shall consist of an On/Off Power switch, Mode Selector, Silent Button (for outdoor unit), Fan Setting, Swing Louver, On/Off Timer Setting, Temperature Adjustment, “Intelligent Eye” sensor, Home Leave Operation, Powerful Operation.
    i. On/Off switch power the system on or off mode.
    ii. Mode selector shall operate the system in auto, cool, heat, fan or dry operation
    iii. Silent shall operation shall lower the sound level of the outdoor unit by slowing the inverter driven fan speed.
    iv. Fan setting shall provide high, medium or low fan speed.
    v. Swing louver shall adjust the airflow (horizontal and vertical) blades.
    vi. On/Off timer is used for automatically switching the unit on or off.
    vii. Temperature adjustment allows for the increase or decrease of the desired temperature.
    viii. Intelligent eye provides an infrared sensor which detects movement and adjusts the temperature by 3.6°F up or down depending on operating mode.
    ix. Home leave operation allows you to record your favorite temperature and airflow setting and allow the system to set back by 3°F.
    x. Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
3. The infrared remote control shall perform Fault Diagnostic functions which may be system related, indoor unit or outdoor unit related depending on the fault code. Temperature range on the remote control shall be 64°F to 90°F in cooling mode and 50°F to 86°F in heating mode.
4. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
5. The system has automatic restart capability after a power failure has occurred.

G. A condensate pump shall be provided and field wired to the indoor unit where scheduled.

2.04 OUTDOOR UNIT (3/4-ton to 2-ton) FOR USE WITH WALL MOUNT INDOOR UNIT

General:

The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls.

A. Unit Cabinet:

The cabinet shall be Ivory White with a finished powder coated backed enamel paint.

B. Fan

1. The fan shall be a direct drive, propeller type fan.
2. The motor shall be inverter drive, permanently lubricated type bearings, inherent.
3. The fan shall be capable of operating in “silent operation” which lowers the outdoor fan speed in either cool, heat or auto modes.
4. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
5. Airflow shall be horizontal discharge.

C. Coil
1. The outdoor coil shall be nonferrous construction with corrugated fin tube.
2. Refrigerant flow from the condenser will be controlled via a metering device.
3. A corrosion resistant coil fin tube shall be provided. Coating shall be an acrylic resin and hydrophilic film, epoxy coating or Copper tube/ Copper fin.

D. Compressor:
1. The compressor shall be rotary swing inverter-driven compressor.
2. The outdoor unit shall have an accumulator, four-way reversing valve.
3. The compressor shall have an internal thermal overload.

E. Electrical:
1. The electrical power requirement is 208/230 volt, 1-phase, and 60 Hz power.
2. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.
3. The outdoor shall be controlled by a microprocessor located in the outdoor and indoor units via commands from the infrared remote controller.
4. Electrical power (208/230 volt) shall be provided to the indoor unit via the outdoor unit.

F. The operating range in cooling mode shall be 14°F DB to 115°F DB.

G. The operating range in heating mode shall be 0°F DB to 64°F DB.

2.05 INDOOR UNIT – CEILING CASSETTE UNIT (2-ton to 3-1/2 ton)

A. General:

The Daikin indoor unit shall be a ceiling cassette fan coil unit, operable with R410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grille. It shall use a four-way air distribution type, ivory white, impact resistant, and washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to maintain room temperature within 1°F. The Unit shall also be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with Daikin remote control BRC1C71 or BRC1D71.

B. Indoor Unit:
1. The Daikin indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The 4-way supply air flow shall be capable of field modification to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump shall provide up to 21” of lift.

7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
9. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:
1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
4. Fresh air intake shall be possible by field cutting as described in Installation manual.
5. A branch duct knockout shall exist for branch ducting supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
7. Optional high efficiency air filters are available for each model unit.

D. Fan:
1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output of 0.12 HP.
3. The air flow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2 row cross fin copper evaporator coil with 17 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate shall be 1 -1/4 inch outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 21 inch lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor shall be located on the liquid and gas line to facilitate Superheat control and PID temperature control logic.

G. Electrical:
1. A separate power supply shall be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor and remote controller shall be a maximum distance of 1,640 feet.

H. Control:
1. The unit shall have factory controls provided to perform input functions necessary to operate the system.
2. A full array of Fault Diagnostics shall be accessible via the Wired Remote Controller.

I. Accessories Required:
1. Remote “in-room” sensor kit (KRCS01-1).

i. A wall mounted, hard wired remote sensor kit is required for ceiling-embedded type fan coils. The sensor for detecting the temperature shall be placed away from the indoor unit (branch wiring shall be included in the kit.)

2.05 OUTDOOR UNIT (2-ton to 3-1/2 ton) FOR USE WITH CEILING CASSETTES

A. General: The outdoor condensing unit is designed specifically for use with matched capacity SkyAir series indoor evaporator units of the ceiling cassette style.
   1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of a scroll compressor, motors, fans, condenser coil, electronic expansion valve, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receivers and accumulators.
   2. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
   3. The outdoor unit can be wired and piped with outdoor unit access from left, right, front or rear.
   4. The sound pressure dB(A) at rated conditions shall be a value of 58 decibels at 3 feet from the front of the unit. The outdoor unit shall be capable of operating at further reduced noise during night time.
   5. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.
   6. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
   7. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers. To ensure the liquid refrigerant does not flash when supplying to the various fan coil units, the circuit shall be provided with a sub-cooling feature.
   8. The operating range in cooling mode shall be 23°F DB to 115°F DB
   9. The operating range in heating mode shall be 0°F DB to 64°F DB

B. Unit Cabinet:
   1. The outdoor unit model shall be completely weather proof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:
   1. The condensing unit shall consist of two propeller type, direct-drive fan 70 W motors that have multiple speed operation via a DC inverter type.
   2. The condensing unit fan motor shall have multiple speed operation of the DC inverter type.
   3. The fan shall be a horizontal discharge configuration with an air flow of 3,740 cfm.
   4. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
   5. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

D. Condenser Coil:
   1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
   2. The coil shall be of a waffle louver fin and high heat exchanger, rifled bore tube design to ensure highly efficient performance.
   3. The coils shall be complete with corrosion treatment of an acrylic resin type. The thickness of the coating must be between 2.0 to 3.0 microns. Alternative corrosion treatment shall be epoxy coated coils or Copper tube/Copper fin.

E. Compressor:
   1. The scroll compressor shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling load as determined by the suction gas pressure as measured in the condensing unit.
   2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC, hermetically sealed scroll type with a maximum speed of 6,480 rpm.
   3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
   4. The capacity control range shall be 24% to 100%, with 20 individual capacity steps.
   5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
   6. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical:
   1. The power supply to the outdoor unit shall be 208/230 volts, 1 phase, 60 hertz with a voltage range from 187 volts to 253 volts.
   2. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded 2 conductor cable.
   3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one outdoor unit with one 2-cable wire, thus simplifying the wiring operation.

END OF SECTION 238130

SECTION 26 05 19
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.3 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For testing agency.

C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. 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.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

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: Subject to compliance with requirements, provide products by one of the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Copper Conductors: Comply with NEMA WC 70.

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

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. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. 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.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 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 and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL 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: Grounding systems and equipment.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
   1. Ground rods.
   2. Ground rings.
   3. Grounding arrangements and connections for separately derived systems.
   4. Grounding for sensitive electronic equipment.

C. Qualification Data: For qualified testing agency and testing agency's field supervisor.

D. Field quality-control reports.

E. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

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. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Bare Grounding Conductor and Conductor Protector for Wood Poles:

1. No. 4 AWG minimum, soft-drawn copper.
2. Conductor Protector: Half-round PVC or wood molding; if wood, use pressure-treated fir, cypress, or cedar.

D. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) 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 to specified height above floor; connect to horizontal bus.

E. 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.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the 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 No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all 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 the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

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 a 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 an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.

G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

H. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

A. Grounding Conductors: 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.

B. Ground Rods: Drive rods until tops are 2 inches (50 mm) 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. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

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. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. 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 a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a 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 a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. 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.

F. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

G. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.

1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
2. 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.

3.5 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

D. 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 a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal , and at individual ground rods. Make tests at ground rods before any conductors are connected.
    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any 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 according to IEEE 81.
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 the record of tests and observations. Include the 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.

E. Grounding system will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

G. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
5. Substations and Pad-Mounted Equipment: 5 ohms.
6. Manhole Grounds: 10 ohms.

H. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 26 05 33
RACEWAYS AND BOXES FOR ELECTRICAL 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. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. ENT: Electrical nonmetallic tubing.

C. EPDM: Ethylene-propylene-diene terpolymer rubber.

D. FMC: Flexible metal conduit.

E. IMC: Intermediate metal conduit.

F. LFMC: Liquidtight flexible metal conduit.

G. LFNC: Liquidtight flexible nonmetallic conduit.

H. NBR: Acrylonitrile-butadiene rubber.

I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
1. For handholes and boxes for underground wiring, including the following:

a. Duct entry provisions, including locations and duct sizes.
b. Frame and cover design.
c. Grounding details.
d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
e. Joint details.

C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

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: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alflex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

C. Rigid Steel Conduit: ANSI C80.1.

D. Aluminum Rigid Conduit: ANSI C80.5.

E. IMC: ANSI C80.6.

F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

G. EMT: ANSI C80.3.

H. FMC: Zinc-coated steel.

I. LFMC: Flexible steel conduit with PVC jacket.

J. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel, set-screw or compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

K. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.
3. Arnco Corporation.
4. CANTEX Inc.
5. CertainTeed Corp.; Pipe & Plastics Group.
6. Condux International, Inc.
7. ElecSYS, Inc.
8. Electri-Flex Co.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type.

E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hoffman.
2. Lamson & Sessions; Carlon Electrical Products.

B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.

1. 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:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors.

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Butler Manufacturing Company; Walker Division.
b. Enduro Systems, Inc.; Composite Products Division.
c. Hubbell Incorporated; Wiring Device-Kellems Division.
d. Lamson & Sessions; Carlon Electrical Products.
e. Panduit Corp.
f. Walker Systems, Inc.; Wiremold Company (The).
g. Wiremold Company (The); Electrical Sales Division.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.

H. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

1. 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:
2. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Armorcast Products Company.
b. Carson Industries LLC.
c. CDR Systems Corporation.
d. NewBasis.

2.8 SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.9 SLEEVE SEALS

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. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

C. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.10 SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A qualified registered professional engineer shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit .
2. Concealed Conduit, Aboveground: Rigid steel conduit.
3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:

    a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
    b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
    c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit.
7. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
8. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
9. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.

C. Minimum Raceway Size: 1/2-inch (16-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 1-Inch (25-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).

1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

O. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

P. 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.

Q. Set metal floor boxes level and flush with finished floor surface.

R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.8 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Advance Products & Systems, Inc.
b. CALPICO, Inc.
c. Metraflex Company (The).
d. Pipeline Seal and Insulator, Inc.
e. Proco Products, Inc.

2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.

4. 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. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. 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 annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal 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.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [**steel**] [**cast-iron**] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

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.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL 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. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Colors for Raceways Carrying Circuits at 600 V and Less:

1. Black letters on an orange field.
2. Legend: Indicate voltage[**and system or service type**].

C. Colors for Raceways Carrying Circuits at More Than 600 V:

1. Black letters on an orange field.
2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.5 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.

2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE,.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE,.

C. Tag: [**Type I**] <**Insert drawing designation**>:

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Thickness: 4 mils (0.1 mm).
3. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
4. 3-Inch (75-mm) Tensile According to ASTM D 882: 30 lbf (133.4 N), and 2500 psi (17.2 MPa).

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.

3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).

3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select 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 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

I. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than [**30**] <**Insert number**> A, and [**120**] <**Insert number**> V to ground: Identify with [**self-adhesive vinyl label**] [**self-adhesive vinyl tape applied in bands**]. Install labels at [**10-foot (3-m)**] [**30-foot (10-m)**] maximum intervals.

C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

   a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
   b. Colors for 208/120-V Circuits:

      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.

   c. Colors for 480/277-V Circuits:

      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.

   d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. 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.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label Stenciled legend 4 inches (100 mm) high.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Access doors and panels for concealed electrical items.
    d. Switchgear.
    e. Switchboards.
    f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    g. Substations.
    h. Emergency system boxes and enclosures.
    i. Motor-control centers.
    j. Enclosed switches.
    k. Enclosed circuit breakers.
    l. Enclosed controllers.
    m. Variable-speed controllers.
    n. Push-button stations.
    o. Power transfer equipment.
    p. Contactors.
    q. Remote-controlled switches, dimmer modules, and control devices.
    r. Battery-inverter units.
    s. Battery racks.
    t. Power-generating units.
    u. Monitoring and control equipment.
    v. UPS equipment.

END OF SECTION 260553

SECTION 26 27 26
WIRING DEVICES

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. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Wall-box motion sensors.
4. Isolated-ground receptacles.
5. Snap switches and wall-box dimmers.

B. Related Sections include the following:

1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. 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.

C. Comply with NFPA 70.

1.6 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
5.

2.2 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).

B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Hubbell; CR 5253IG.
      b. Leviton; 5362-IG.
      c. Pass & Seymour; IG6300.

   2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.3 GFCI RECEPTACLES

A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   2. Products: Subject to compliance with requirements, provide one of the following:

      a. Cooper; GF20.
      b. Pass & Seymour; 2084.

2.4 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Cooper; L520R.
      b. Hubbell; HBL2310.
      c. Leviton; 2310.
      d. Pass & Seymour; L520-R.

B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:

      a. Hubbell; IG2310.
      b. Leviton; 2310-IG.

   2. Description: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498. Equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.

2.5 SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Key-Operated Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 2221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

D. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d. Pass & Seymour; 1251.

E. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
1. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.6 WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.

B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.

C. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 OCCUPANCY SENSORS

A. Wall-Switch Sensors:
1. Products: Subject to compliance with requirements, provide one of the following:

    a. Cooper; 6111 for 120 V, 6117 for 277 V.
    b. Hubbell; WS1277.
    c. Leviton; ODS 10-ID.
    d. Pass & Seymour; WS3000.
    e. Watt Stopper (The); WS-200.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

B. Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; AT120 for 120 V, AT277 for 277 V.
    b. Leviton; ODS 15-ID.

3. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

C. Long-Range Wall-Switch Sensors:
1. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; ATP1600WRP.
    b. Leviton; ODWWV-IRW.
    c. Pass & Seymour; WA1001.
    d. Watt Stopper (The); CX-100.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

D. Long-Range Wall-Switch Sensors:
1. Products: Subject to compliance with requirements, provide one of the following:

    a. Hubbell; ATD1600WRP.
    b. Leviton; ODW12-MRW.
    c. Watt Stopper (The); DT-200.

2. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft. (111 sq. m).

E. Wide-Range Wall-Switch Sensors:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; ATP120HBRP.
b. Leviton; ODWHB-IRW.
c. Pass & Seymour; HS1001.
d. Watt Stopper (The); CX-100-3.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

F. Exterior Occupancy Sensors:
1. Products: Subject to compliance with requirements, provide one of the following:

a. Leviton; PS200-10.
b. Watt Stopper (The); EW-100-120.
c.

2. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot (34-m) detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent.

2.8 FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.

B. Compartments: Barrier separates power from voice and data communication cabling.

C. Service Plate: Rectangular, with satin finish.

D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.

E. Voice and Data Communication Outlet: Blank cover with bushed cable opening.

2.9 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.
3. Isolated-Ground Receptacles: As specified above, with orange triangle on face.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 26 28 16
ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. 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.

E. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.7 COORDINATION

A. 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.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
2. Fuse Pullers: Two for each size and type.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
3. Lugs: Compression type, suitable for number, size, and conductor material.
4. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. Siemens Energy & Automation, Inc.
3. Square D; a brand of Schneider Electric.

C. Type HD, Heavy Duty, Single Throw, 600-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.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Lugs: Compression type, suitable for number, size, and conductor material.

2.3 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with 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. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "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 Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. 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.

D. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

E. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. 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.

3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Overcurrent Protective Device Coordination Study".

END OF SECTION 262816

COM*check* Software Version COMcheckWeb

Interior Lighting Compliance Certificate

Project Information

Energy Code: 2021 IECC
Project Title: TRIUMPH HIGH SCHOOL FINISH-OUT AT GRACE POINT CHURCH
Project Type: New Construction

Construction Site:
221 OAK STREET
ABILENE, Texas 79602

Owner/Agent:
LAURA WARREN, A.I.A.
THE WARREN GROUP ARCHITECTS, INC.
804 S. MAIN STREET
McALLEN, Texas 78501
956-994-1900

Designer/Contractor:
ABRAM L. DOMINGUEZ
MEP SOLUTIONS ENGINEERING
600 E. BEAUMONT AVE.
MCALLEN, Texas 78501
956-664-2727

Additional Efficiency Package(s)

Credits: 10.0 Required 0.0 Proposed

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts
1-School/University	627	0.72	451
		Total Allowed Watts =	451

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B Lamps/ Fixture	C # of Fixture	D Fixture Watt.	E (C X D)
1-School/University				
LED 1: TYPE A: 6" RECESSED DOWNLIGHT: Other:	1	2	13	26
LED 2: TYPE B: 4' RECESSED PERIMETER LIGHTING: Other:	1	27	14	378
LED 3: TYPE C: 2' RECESSED PERIMETER LIGHTING: Other:	1	1	14	14
			Total Proposed Watts =	418

Interior Lighting PASSES: Design 7% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 2021 IECC requirements in COM*check* Version COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

ABRAM L. DOMINGUEZ, PE
Name - Title

Abram L. Dominguez
Signature

01/15/2024
Date

COM*check* Software Version COMcheckWeb

Inspection Checklist

Energy Code: 2021 IECC

Requirements: 0.0% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
C103.2 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C406 [PR9][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the additional energy efficiency package options.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.3.1 [EL22][1]	Spaces required to have light-reduction controls have a manual control that allows the occupant to reduce the connected lighting load in a reasonably uniform illumination pattern >= 50 percent.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1, C405.2.1.1 [EL18][1]	Occupancy sensors installed in classrooms/lecture/training rooms, conference/meeting/multipurpose rooms, copy/print rooms, lounges/breakrooms, enclosed offices, open plan office areas, restrooms, storage rooms, locker rooms, corridors, warehouse storage areas, and other spaces <= 300 sqft that are enclosed by floor-to-ceiling height partitions. Reference section language C405.2.1.2 for control function in warehouses and section C405.2.1.3 for open plan office spaces.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1.2 [EL19][1]	Occupancy sensors control function in warehouses: In warehouses, the lighting in aisleways and open areas is controlled with occupant sensors that automatically reduce lighting power by 50% or more within 20 minutes of when the areas are unoccupied. The occupant sensors control lighting in each aisleway independently and do not control lighting beyond the aisleway being controlled by the sensor. Lights not turned off by occupant sensors is done so by time-switch.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.1.3 [EL20][1]	Occupant sensor control function in open plan office areas: Occupant sensor controls in open office spaces >= 300 sq.ft. have controls 1) configured so that general lighting can be controlled separately in control zones with floor areas <= 600 sq.ft. within the space, 2) general lighting in each zone permitted to turn on upon occupancy in control zone, 3) automatically turn off general lighting in all control zones within 20 minutes after all occupants have left the space, 4) are configured so that general lighting power in each control zone is reduced by >= 80% of the full zone general lighting power within 20 minutes of all occupants leaving that control zone.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.2, C405.2.2.1 [EL21][2]	Each area not served by occupancy sensors (per C405.2.1.1) have time-switch controls and functions detailed in sections C405.2.2.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
C405.2.4, C405.2.4.1, C405.2.4.2 [EL23][2]	Daylight zones provided with individual controls that control the lights independent of general area lighting. See code section C405.2.3 Daylight-responsive controls for applicable spaces, C405.2.3.1 Daylight responsive control function and section C405.2.3.2 Sidelit zone.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.2.5 [EL27][1]	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.7 [EL26][2]	Low-voltage dry-type distribution electric transformers meet the minimum efficiency requirements of Table C405.6.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.8 [EL27][2]	Electric motors meet the minimum efficiency requirements of Tables C405.7(1) through C405.7(4). Efficiency verified through certification under an approved certification program or the equipment efficiency ratings shall be provided by motor manufacturer (where certification programs do not exist).	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.9.1, C405.9.2 [EL28][2]	Escalators and moving walks comply with ASME A17.1/CSA B44 and have automatic controls configured to reduce speed to the minimum permitted speed in accordance with ASME A17.1/CSA B44 or applicable local code when not conveying passengers.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.10 [EL29][2]	Total voltage drop across the combination of feeders and branch circuits <= 5%.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.1.1 [EL30][2]	At least 90% of dwelling unit permanently installed lighting shall have lamp efficacy >= 65 lm/W or luminaires with efficacy >= 45 lm/W or comply with C405.2.4 or C405.3.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C405.11, C405.11.1 [EL31][2]	50% of 15/20 amp receptacles installed in enclosed offices, conference rooms, copy rooms, break rooms, classrooms and workstations and > 25% of branch circuit feeders for modular furniture will have automatic receptacle control in accordance with C405.11.1.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
C303.3, C408.2.5.2 [FI17][3]	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.1.1 [FI57][1]	Building operations and maintenance documents will be provided to the owner. Documents will cover manufacturers' information, specifications, programming procedures and means of illustrating to owner how building, equipment and systems are intended to be installed, maintained, and operated.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.2.5 [FI16][3]	Furnished as-built drawings for electric power systems within 90 days of system acceptance.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	
C408.3 [FI33][1]	Lighting systems have been tested to ensure proper calibration, adjustment, programming, and operation.	☐Complies ☐Does Not ☐Not Observable ☐Not Applicable	

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Triumph High School Finish-out
HVAC Load Analysis

for

Grace Point Church
221 Oak Street.
Abilene, Texas 79602

Elite Software

CHVAC Commercial HVAC Loads

Prepared By:

Jpena
Mep Solutions
600 E Beaumont Ave
Mcallen
664-2727
Wednesday, January 3, 2024

Building Summary Loads

Building peaks in July at 3pm.

Bldg Load Descriptions	Area Quan	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Roof	466	2,055	22.31	0	2,980	2,980	32.05
Wall	252	1,429	15.51	0	843	843	9.06
Glass	0	0	0.00	0	0	0	0.00
Floor Slab	140	4,410	47.89	0	0	0	0.00
Skin Loads		7,894	85.71	0	3,823	3,823	41.11
Lighting	699	0	0.00	0	2,504	2,504	26.94
Equipment	466	0	0.00	0	1,670	1,670	17.96
People	0	0	0.00	0	0	0	0.00
Partition	0	0	0.00	0	0	0	0.00
Cool. Pret.	0	0	0.00	0	0	0	0.00
Heat. Pret.	0	0	0.00	0	0	0	0.00
Cool. Vent.	0	0	0.00	0	0	0	0.00
Heat. Vent.	0	0	0.00	0	0	0	0.00
Cool. Infil.	0	0	0.00	0	0	0	0.00
Heat. Infil.	0	0	0.00	0	0	0	0.00
Draw-Thru Fan	0	0	0.00	0	586	586	6.30
Blow-Thru Fan	0	0	0.00	0	0	0	0.00
Reserve Cap.	0	0	0.00	0	0	0	0.00
Reheat Cap.	0	0	0.00	0	0	0	0.00
Supply Duct	0	877	9.52	0	477	477	5.13
Return Duct	0	439	4.76	0	238	238	2.56
Misc. Supply	0	0	0.00	0	0	0	0.00
Misc. Return	0	0	0.00	0	0	0	0.00
Building Totals		9,210	100.00	0	9,297	9,297	100.00

Building Summary	Sen Loss	%Tot Loss	Lat Gain	Sen Gain	Net Gain	%Net Gain
Ventilation	0	0.00	0	0	0	0.00
Infiltration	0	0.00	0	0	0	0.00
Pretreated Air	0	0.00	0	0	0	0.00
Zone Loads	7,894	85.71	0	7,997	7,997	86.01
Plenum Loads	0	0.00	0	0	0	0.00
Fan & Duct Loads	1,316	14.29	0	1,301	1,301	13.99
Building Totals	9,210	100.00	0	9,297	9,297	100.00

Check Figures

Total Building Supply Air (based on a 19° TD):	462	CFM
Total Building Vent. Air (0.00% of Supply):	0	CFM
Total Conditioned Air Space:	466	Sq.ft
Supply Air Per Unit Area:	0.9924	CFM/Sq.ft
Area Per Cooling Capacity:	601.5	Sq.ft/Ton
Cooling Capacity Per Area:	0.0017	Tons/Sq.ft
Heating Capacity Per Area:	19.76	Btuh/Sq.ft
Total Heating Required With Outside Air:	9,210	Btuh
Total Cooling Required With Outside Air:	0.77	Tons

Air Handler #1 - AHU-1 - Summary Loads

Zn No	Description Zone Peak Time	Area People Volume	Htg.Loss Htg.CFM CFM/Sqft	Sen.Gain Clg.CFM CFM/Sqft	Lat.Gain S.Exh W.Exh	Htg.O.A. Req.CFM Act.CFM	Clg.O.A. Req.CFM Act.CFM
1	Men Restroom 112	233	3,947	3,998	0	20/P	20/P
	3pm July	0	217	231	0	0	0
		2,330	0.93	0.99	0	0	0
2	Men Restroom 112	233	3,947	3,998	0	20/P	20/P
	3pm July	0	217	231	0	0	0
		2,330	0.93	0.99	0	0	0
	Zone Peak Totals:	466	7,894	7,997	0		
	Total Zones: 2	0	433	462	0	0	0
	Unique Zones: 2	4,660	0.93	0.99	0	0	0

Air Handler #1 - AHU-1 - Total Load Summary

Air Handler Description:	AHU-1 Constant Volume - Sum of Peaks
Supply Air Fan:	Draw-Thru with program estimated horsepower of 0.25 HP
Fan Input:	65% motor and fan efficiency with 2.2 in. water across the fan
Sensible Heat Ratio:	1.00 --- This system occurs 1 time(s) in the building. ---

Air System Peak Time:	3pm in July.
Outdoor Conditions:	Clg: 102° DB, 71° WB, 71.84 grains, Htg: 15° DB
Indoor Conditions:	Clg: 75° DB, 50% RH, Htg: 75° DB

Summer: Exhaust controls outside air, ----- Winter: Exhaust controls outside air.

Zone Space sensible loss:	7,894 Btuh		
Infiltration sensible loss:	0 Btuh	0 CFM	
Outside Air sensible loss:	0 Btuh	0 CFM	
Supply Duct sensible loss:	877 Btuh		
Return Duct sensible loss:	439 Btuh		
Return Plenum sensible loss:	0 Btuh		
Total System sensible loss:			9,210 Btuh
Heating Supply Air: 8,771 / (.937 X 1.08 X 20) =		433 CFM	
Winter Vent Outside Air (0.0% of supply) =		0 CFM	
Zone space sensible gain:	7,997 Btuh		
Infiltration sensible gain:	0 Btuh		
Draw-thru fan sensible gain:	586 Btuh		
Supply duct sensible gain:	477 Btuh		
Reserve sensible gain:	0 Btuh		
Total sensible gain on supply side of coil:			9,059 Btuh
Cooling Supply Air: 9,059 / (.937 X 1.1 X 19) =		462 CFM	
Summer Vent Outside Air (0.0% of supply) =		0 CFM	
Return duct sensible gain:	238 Btuh		
Return plenum sensible gain:	0 Btuh		
Outside air sensible gain:	0 Btuh	0 CFM	
Blow-thru fan sensible gain:	0 Btuh		
Total sensible gain on return side of coil:			238 Btuh
Total sensible gain on air handling system:			9,297 Btuh
Zone space latent gain:	0 Btuh		
Infiltration latent gain:	0 Btuh		
Outside air latent gain:	0 Btuh		
Total latent gain on air handling system:			0 Btuh
Total system sensible and latent gain:			9,297 Btuh

Check Figures

Total Air Handler Supply Air (based on a 19° TD):	462 CFM
Total Air Handler Vent. Air (0.00% of Supply):	0 CFM
Total Conditioned Air Space:	466 Sq.ft
Supply Air Per Unit Area:	0.9924 CFM/Sq.ft
Area Per Cooling Capacity:	601.5 Sq.ft/Ton
Cooling Capacity Per Area:	0.0017 Tons/Sq.ft
Heating Capacity Per Area:	19.76 Btuh/Sq.ft
Total Heating Required With Outside Air:	9,210 Btuh
Total Cooling Required With Outside Air:	0.77 Tons

Zone Detailed Loads (At Zone Peak Times)

Load Description	Unit Quan	-SC- CFAC	CLTD SHGF	U.Fac -CLF-	Sen. Gain	Lat. Gain	Htg. Mult.	Htg. Loss
Zone 1-Men Restroom 112 peaks (sensible) in July at 3pm, Air Handler 1 (AHU-1), Group 0, 1.0 x 233.0, Construction Type: 1 (Light)								
Roof-1-1-Susp.C-D	233	1.00	87.0	0.070	1,419		4.200	979
Wall-1-E-D-M	126	0.83	35.4	0.090	401		5.400	680
Lights-Prof=0	350	1.000			1,193			
Equipment-Prof=0	233	1.000			795	0		
Floor slab	70						30.000	2,100
Sub-total					3,808	0		3,759
Safety factors:					+5%	+5%		+5%
Total w/ safety factors:					3,998	0		3,947
Zone 2-Men Restroom 112 peaks (sensible) in July at 3pm, Air Handler 1 (AHU-1), Group 0, 1.0 x 233.0, Construction Type: 1 (Light)								
Roof-1-1-Susp.C-D	233	1.00	87.0	0.070	1,419		4.200	979
Wall-1-E-D-M	126	0.83	35.4	0.090	401		5.400	680
Lights-Prof=0	350	1.000			1,193			
Equipment-Prof=0	233	1.000			795	0		
Floor slab	70						30.000	2,100
Sub-total					3,808	0		3,759
Safety factors:					+5%	+5%		+5%
Total w/ safety factors:					3,998	0		3,947